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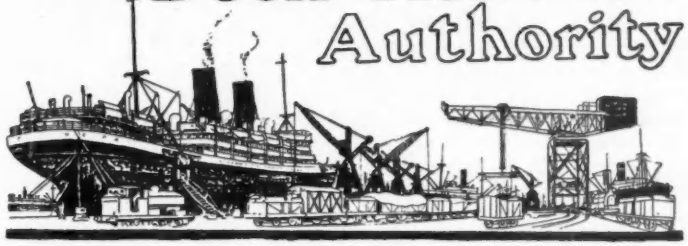
CONTRIBUTIONS:

All Letters and Contributions intended for Publication should be addressed to:—
K. R. DOGGETT, Editor,
"The Dock and Harbour Authority,"
19, Harcourt Street, London, W.1.
Telephone: PADdington 0077/8.

The Dock & Harbour Authority



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Editorial Comments

The Port of Haifa.

From the time Great Britain assumed the mandate for Palestine in 1922, the trade of the country increased so appreciably, that, within a few years, it became essential to provide additional accommodation for shipping. The British Government therefore decided, in 1927, to construct an up to date harbour at Haifa, which is situated in the embayment on the shore of the Bay of Acre, and is well protected from the south and west winds by Mount Carmel.

Haifa is the only deep-water harbour in the country, as owing to the exposed nature of the coast, it has, so far at least, been found impracticable to construct a port anywhere else along the littoral of Palestine. Any scheme, to give sufficient shelter for shipping, would require the provision of such extensive protection works that it would prove exceedingly costly.

A brief description of the work involved in constructing the new port at Haifa appeared in the December 1933 issue of this Journal, and for the further details which are to be found elsewhere in this issue, we are indebted to Messrs. Rendel, Palmer and Tritton, the engineers rsponsible for planning and supervising the undertaking.

In spite of the tense political situation and the unsettled state of the country prevailing at present, there continues to be a steady increase in the volume of trade, and should this expand any further, a corresponding increase in port capacity will be essential. It is reported that the High Commissioner for Palestine has appointed a standing committee to keep under constant review the needs of the ports of Haifa, Jaffa and Tel Aviv, and one of its chief duties will be to consider any proposals which will facilitate improved port working.

The suggestion has been advanced by many commercial interests in Palestine, that the country, small as it is, cannot depend on one deep-water harbour only, and whatever extensions may be made at Haifa, a second port is indispensable. The position, apparently, has become serious, especially in view of the sudden rise in imports during the last 12 months, and in order to find a solution to the problem, a visit was recently made by a Mission who carried out a thorough survey of all port facilities. One of the recommendations the Mission made was that cargo bound for Jaffa or Tel Aviv should be shipped direct to those ports instead of passing through Haifa. The construction of a second deep-water harbour was also strongly advocated.

Fortunately, as far as Haifa is concerned, the original plans prepared by the Consulting Engineers. made provision for further extensive development whenever the need should arise, and although the extent to which these plans will eventually be implemented is still uncertain, it appears that the full expansion scheme, or an alternative plan, giving equal, if not greater, shipping and storage capacity will have to be carried out very shortly.

Dockers' Decasualisation Report.

The subject of the decasualisation of port labour has so often been commented upon in these columns that it seems somewhat jejune to allude to it again. Nevertheless, it still forms an unsolved problem of great importance in port administration, and the report of Sir John Forster, which is summarised in the present issue, claims careful and considered attention. We will leave our readers to study it in detail and merely confine our notice to one or two outstanding points.

One of these is the claim of the workers to joint and equal control with the employers over the employment register. Under existing conditions, administration is in the hands of the Port Authority on which the workers say that they have little or no direct representation. They contend that they should be consulted in regard to the size of the dock labour force, whereas the employers regard this and certain other consequent matters as coming within the appropriate judgment of their unfettered discretion. It cannot but be felt that the workers will naturally always be opposed to a reduction in the number employed, whereas employers must be guided by considerations of economy. Obviously, the industry cannot afford to carry an overload of unremunerative labour. As the report points out, this might entail such a charge on the guarantee fund that a rise in prices for commodities would result at the expense of the public.

Sir John Forster concedes in the main the workers' point of view and recommends the formation of a central administrative body drawn in equal numbers from both sides, with the addition of an independent element, consisting of a Chairman and two Members appointed by the Ministry of Labour.

Another point is in regard to the compulsory mobility of port labour, to which the workers entertain a great objection, especially in the case of ports at some distance from their home port. It is an unfortunate feature of dock operation that it does require a certain degree of mobility if unemployment is to be avoided when there is local lack of demand or supply. Yet, as in the case of other avocations, as for instance, seafaring or business enterprise in foreign lands, absence from home for extended periods must be looked on as an inevitable condition of employment. Sir John Forster regards it as the price to be paid for a permanent decasualisation scheme and we do not see any reasonable alternative.

Editorial Comments—continued

The Approach to Nationalisation.

The greater part of the Transport Bill, details of which were published too late for notice in our December issue, deals with the Government's plans to bring under State ownership all the nation's inland transport facilities, and is therefore, to a large extent, outside the purview of this Journal. With regard to the sections dealing with the plans to nationalise Ports and Inland Waterways, however, the proposals will cause grave concern to all dock and harbour interests in the country, as the whole future of the industry is put into a state of jeopardy.

Briefly, the purpose of the Bill is to set up a British Transport Commission, consisting of a chairman and four other members, whose duty will be " to provide, secure and/or promote the provision of an efficient, economical and properly integrated system of public inland transport and port facilities within Great Britain, and to extend and improve that system." To assist the Commission in the discharge of their functions, five bodies, to be known as Executives, are to be established—one each for Railways, Docks and Inland Waterways, Road Transport, London Passenger Transport, and Hotels. The Minister will select the members who are to form the Commission and the Executive bodies, and has power to give directions of a general character in matters appearing to him to affect the national interest.

As far as the harbours of the country are concerned, provision is made for area schemes to be prepared by the Commission. The body established to provide port facilities under such a scheme may be the Commission or any other body. The body so established may direct that port facilities in the area concerned are to be carried on only under licence. Provision is made for appeals. Any scheme must be submitted to the Minister who, if he approves, is to make an Order giving effect to it, but if objection is made, the Order will not come into operation without special Parliamentary procedure.

The extraordinary and most sinister feature of the Bill is the extent of the power and responsibility which is placed in the hands of the Minister of Transport. The five members of the Commission of Control are to be his nominees and, in addition, he has the appointment of the members of the executives, numbering in all some fifty officials. With his directive functions to the whole, either as commissioners or executives, he will possess almost unlimited powers of control and become *de facto* dictator. It is surely unwise to leave so much of trade interest at the mercy of a possibly inexpert and politically-minded Minister.

It is also a matter for regret that the measure is to be forced through Parliament at top speed, without due opportunity for detailed examination by the interests affected and with the minimum of debate on its many and complicated provisions. Legislation of this character is an extremely hazardous proceeding and is fraught with possibilities of irreparable disaster to the national welfare. We feel that the call for a public enquiry is one that should not be disregarded.

In view of the pressure of legislative business at present occupying the attention of the Government, the Bill can only be regarded as ill-timed as it is ill-digested. The urgency with which many new and important measures are being rushed through Parliament makes it impossible for due thought and consideration to be given to each. The country is, therefore, confronted with a serious danger that the problems and difficulties which are being so lightly brushed aside, but which will have to be encountered in years to come, will prevent a successful working of the laws which are being placed so rapidly on the Statute Book.

The obvious haste with which the present Bill has been compiled—without seeking the guidance of trade and industry—has made the measure arbitrary and unwieldy. No attempt has been made to show why such fundamental changes in the transport system of the country are necessary, and no constructive plans have been given regarding the future of the various sections of transport which are to be taken over. This lack of guidance towards the objects it seeks to achieve has left all those likely to be affected by the measure in a state of bewilderment and uncertainty.

More especially, this feeling of uncertanty must pervade the Port industry, as no definite information is given about its future. As matters stand at present, it appears that, under the wide permissive powers of the Bill, the Government proposes to set up in Great Britain a publicly-owned system of ports, but what form this system will take needs clarification.

We are not concerned with the principles of nationalisation, and, as the Bill is only in its embryo stage, it is, in any case, too early to pass judgment. It is to be hoped, however, that during the debates in Parliament and in the committee stage, those supporting the measure will be able to elucidate exactly what public ownership of the docks and harbours of this country implies, whether any change in the present system would be beneficial to the trade of the country, and, if so, what form the new regime should take.

The attention of our readers is directed to the observations on the Bill made by the General Council of British Shipping and reproduced on a later page. The Traders' Dock and Harbour Co-ordinating Committee have issued a statement on similar lines, condemning the Bill as involving detrimental consequences to the trade of the country.

The attitude of the Dock and Harbour Authorities' Association, so far as it has been made known, is not inimical to the principle of public ownership of ports, on the ground that virtually all the large ports, apart from those owned by the railway companies, are already administered by public trusts. It is pointed out, however, by the General Council of British Shipping that while under the present system in operation in the major ports of the country the controlling body is representative of port users on a wide basis, the Bill has powers to bring all the ports under State ownership, without provision for representation by port users.

Competition Between Sea and Air Travel.

During the war, when air transport received such an impetus, and new inventions and navigational devices made flying much safer, many people expressed the opinion that the aeroplane would become a serious competitor to the passenger liner in transporting passengers over the long-distance sea routes. As if to endorse this view, for the past 12 or 18 months following the conclusion of hostilities, commercial aviation expanded to an extraordinary degree, and the number of passengers carried by air exceeded the most optimistic forecasts of the exponents of air travel.

Now that luxury passenger liners are being released from their war duties and are resuming their peace-time pursuits, however, there are already indications that the slower, but safer, method of transport finds favour with by far the greater majority. It is interesting to observe that since the Cunard White Star liner *Queen Elizabeth* and the *America* of the United States Lines, resumed commercial sailings, there has been an appreciable decline in the number of bookings for air travel, and as a result of this, many of the leading air lines have been compelled to reduce their staffs. It is significant that although serious liner competition was only resumed a matter of a few weeks ago, Pan American Airways have already dismissed about 20 per cent. of their 3,000 employees in the Atlantic Division, and the Trans-World Air Line have informed many of their staff that they will be compelled to take similar action.

This falling off in air travel is, to some extent, seasonal, but there is no doubt that many people feel they can travel more surely and more comfortably, by sea. Also, during the past 12 months, many passengers who made long voyages by air only did so after they had visited steamship offices and had been informed that it would be impossible to obtain a berth in a liner for some time to come.

In the foregoing conditions and under the cloud of recent flying disasters, it would appear that air travel must suffer a temporary set-back after the perhaps unduly promising prospects of the past year or two. Yet flying is still in its infancy, and much may be expected from development in the course of time. None the less, the situation need not cause misgivings for the future of the mercantile marine, particularly as regards cargo ships, for which the demand is bound to continue. Passenger vessels will, in all probability, suffer some reduction in popularity, but there is hardly likely to be any startling revolution in ocean-going traffic in the immediate future.

The Port of Haifa, Palestine

An Account of the Development of a Modern Harbour

Introductory

IN ancient times Palestine formed an important link in the caravan trade from Egypt and the south and with the markets of the east and west, but there was also a considerable maritime trade with countries bordering on the shores of the Mediterranean. In these days Haifa and Jaffa (the Joppa of Biblical times) were the chief ports in Palestine.

At Haifa some protection was afforded to ships in the bay under the shelter of Mount Carmel, whilst at Jaffa a reef extended along the shore and formed a small natural harbour which afforded sufficient shelter for the small shallow draft vessels of that time.

With the growth of sea-borne trade, vessels increased in size and it became necessary for them to anchor off the cost and for goods to be lightered ashore, but considerable loss and damage was sustained by goods during bad weather.

The necessity of providing one or more harbours on the Palestine seaboard had become acute, and before the 1914-1918 war the Turkish Government had granted a concession to a French syndicate which included the right to construct harbours at Haifa and Jaffa.

After the war when Great Britain accepted the mandate for the administration of the country, the question of providing a suitable and serviceable port was one of the chief items in the scheme of development.

The British Government, through the Crown Agents for the Colonies, then commissioned the late Sir Frederick Palmer, Past President of the Institution of Civil Engineers, to visit Palestine and report on the construction of a harbour at the most suitable site.

His report, which was submitted in 1923, recommended the construction of a deep-water harbour at Haifa, which is situated on the southern shore of the Bay of Acre. Along the whole coast line of Palestine extending to about 150 miles, this was the only place which offered some natural protection for a modern harbour; if coastal conditions had been more favourable the site selected for the harbour would have been at Jaffa, which is the nearest port to Jerusalem and is favourably situated for the important and growing orange trade which forms the chief export of Palestine. Reefs of rocks extend along the shore at Jaffa, and whilst these could be utilised for shelter for lighters at comparatively small expenditure, the formation is not suitable economically for the construction of a deep-water harbour.

In 1927 the Government adopted Sir Frederick Palmer's recommendation and instructions were given to proceed with the work, and Rendel, Palmer & Tritton were appointed as Consulting Engineers for the whole of the work.

A survey party was sent from England and soundings and borings were taken over the water area proposed to be enclosed within the breakwaters.

Although the borings showed that the sea bottom consisted mostly of fine sand down to the proposed dredged level, some rock was found inshore and as a result of this and other information gained, the provisional lay-out was amended and the area to be reclaimed, by the dredged sand being pumped ashore, was increased to about 90 acres.

General View at the back of the Quay, showing Transit Sheds and Dump Areas.

The estimate for the first stage of the works was £1,250,000, but this covered only about 40 per cent. of the full possible internal development, the shell of the harbour being of such dimensions as to permit of additional berths being constructed with ancillary facilities when trade should warrant the expenditure.

Adopted Lay-Out

The harbour as finally designed and constructed is shown in the plan on page 213.

The shell of the harbour is formed by the main and lee breakwaters within which the quay and rubble dykes are located and which serve to retain the reclamation along the shore.

The main breakwater is about 1½ miles in length and lies due east from the root, which is about ½ mile from the promontory Ras-el-Kerum at the seaward end of the Mount Carmel range. The lee breakwater is about ½ mile in length and extends northwards from the old railway jetty, giving an entrance 600 feet wide at full depth.

The original sea area enclosed between the breakwaters exceeds 300 acres, of which about 175 acres have been dredged. About 90 acres have been reclaimed from the sea, of which 40 acres are enclosed within the customs fence and 50 acres have been taken into the town area for commercial development.

The main wharves are sited on the shore side, stern-on moorings at the main breakwater, and an oil dock has been provided within the harbour and adjoining the Lee Breakwater.

The Port of Haifa, Palestine—continued

The deep-water quay as at present constructed is 1400 feet long, but additional berths extending to about 3000 feet in length can be built when required.

Construction

Originally it was intended that the work would be carried out by contract, but in February 1929 the Government decided to undertake the works departmentally. The construction of a harbour was a major work for a small country like Palestine, and it was decided to form a special Haifa Harbour Works Department with Engineers and Foremen with the necessary experience for carrying out this specialised work.

As the Consulting Engineers were to be responsible for the lay-out and design and also to have direct control in all technical matters in the construction, it was left to them to recommend the appointment of the senior members of the technical staff to carry out the works, other grades and staff being recruited locally.

Preliminary work was started in April 1929 and the first train load of stone for the main breakwater was despatched in October of that year.

As the main and lee breakwaters would cost approximately 50 per cent. of the total estimated cost of the harbour, a quarry had to be found from which suitable large natural blocks could be obtained, for if artificial concrete blocks were used the increase in cost would have been about £200,000. After considerable investigation it was decided to open up a quarry at Athlit, about 10 miles south of the harbour.

The stone from this coastal ridge gave promise that large size blocks could be obtained and the remains of the old Crusader Castle at Athlit which was built with this stone showed that the weathering qualities were promising. Actually the result was very satisfactory and all the stone required was procured from this quarry from the smallest size up to 15 to 20-ton blocks required to withstand waves up to 5 metres trough to crest for which the breakwater was designed.

In January 1931 the breakwater, which was in an unfinished state, was severely tested by the worst storm that Haifa had experienced for 30 years, and although green seas topped the breakwater, no damage was done to the permanent work and only minor damage to the tracks and plant which was made good within a day or two after the storm abated.

Main Breakwater

The total amount of stone in the main breakwater is about 1,100,000 tons and the maximum quantity deposited in one month was 69,000 tons.

For dealing with the large sized stone a pillar crane was specially designed which could handle 15-ton stones at a radius of 65 feet. The crane was run outwards and built up the breakwater to 2 metres, and on the return journey it built up behind it to the finished level of 4 metres with large sized blocks, which were placed on the seaward side to form an additional blanket about 4 metres wide. This method of construction not only permitted initial settlement between the outer and return journeys, but gave earlier protection for other internal works such as the wharf walls and rubble dykes.

The main breakwater was afterwards capped with a concrete parapet which extends the whole length up to 4 metres, and ten 200-ton and nineteen 150-ton bollards have been built into the breakwater for stern-on moorings.

Lee Breakwater

This is of much lighter design than the main breakwater as it is not exposed to the waves from the open sea; the crest is at 2 metres as against 4 metres at the main breakwater.

Navigation Lights

Flashing lights have been provided at the roundheads of both breakwaters; the flash is 0.3 second every 3 seconds. The light on the main breakwater is green and on the lee breakwater it is red, the focal plane of the light in each case being 9.55 metres above mean sea level and the candle power 100 and 60 respectively. The lighting power is acetylene, and they will burn for 3 months without attention and are fitted with a solar valve so that they are lighted and extinguished automatically. The light in both cases is visible at sea level at a distance of 6 miles and from the bridge of an ordinary ship at a distance of over 10 miles.

The existing white flashing light on Mount Carmel is visible from the deck of a ship 26 miles away.

Main Wharf Wall

The length of the wharf is 1400 feet and provides berths for four moderate sized steamers such as normally visit Haifa.

The wall is constructed with concrete blocks on the inclined slice-work principle. This type of construction has the advantage over horizontal coursed blockwork in that it has a very short scarp end, it accommodates itself to a variable foundation without destruction or injury, and can be built by plant travelling on the work as it progresses, without the use of temporary staging.

The primary reason for its adoption was that the bores indicated a probable variation in the ground at foundation level ranging from sand and clay to conglomerate and rock, and the capacity of slice-work to adjust itself to such varied conditions make its adoption suitable.

In the first case a trench was dredged to 36 feet below mean sea level for the foundation, which consisted of 3 feet of coarse broken stone with a topping or screeding layer of 2 inches broken stone, thus forming a bed for the concrete blocks. The inclination of the slice was 1 in 4 or about 76 degrees, and generally each block was a metre in thickness and slightly under 7 tons in weight to enable the work to be carried out by 8 ton cranes. Work was started at the centre of the wall where a short horizontal coursed abutment was built with ends sloping at 1-in-4, construction being carried on from this point by two cranes travelling in opposite directions. The slice-work was loaded with kentledge blocks to assist settlement and these were subsequently removed and replaced with a permanent topping wall of mass concrete with settlement joints every 10th slice.

Lighter Wharf

Extending from the eastern end of the main wharf a lighter wharf about 900 feet in length was constructed. This was similar to but of lighter section than the main wharf and was stepped up from 31 feet of water to 16 feet required.

Rubble Dykes

In order to maintain the reclamation, rubble dykes were constructed at either end of the wharf walls. At the eastern end the dyke joined up to the lee breakwater and at the western end it extended to the foreshore.

Dredging and Reclamation

The material to be dredged within the harbour was chiefly very fine sand which had to be pumped behind the wharf walls and rubble dykes to form the reclamation.

A contract was placed with the Tilbury Contracting & Dredging Company (Egypt) Ltd. and operations were begun in November 1931.

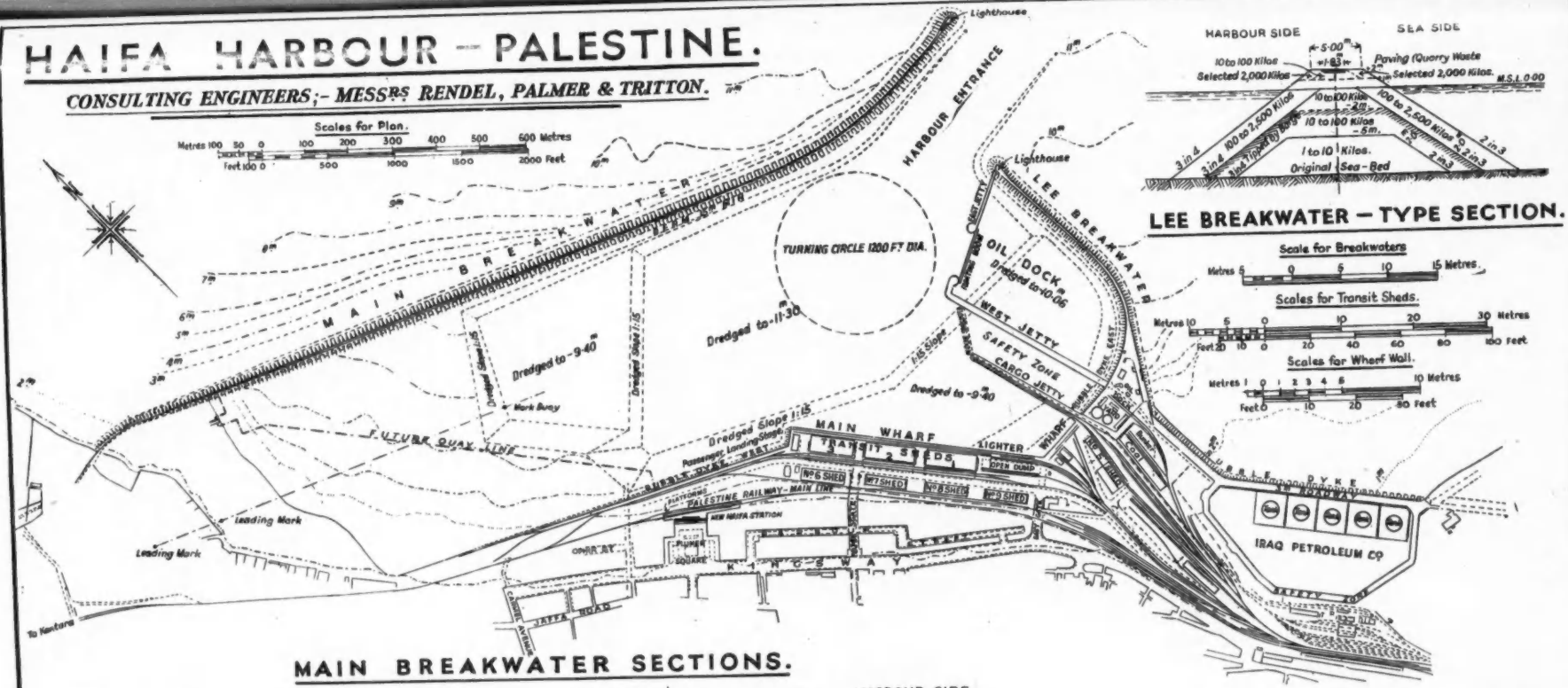
Two dredgers were used, the larger being a 350-H.P. bucket dredger with 1 cub. yd. buckets and the smaller a bucket dredger with ½ cub. yd. buckets. The reclamation pump vessel was 550 H.P. with a 24-inch delivery and the other plant included a steam hopper barge, dumb barges, tug, etc.

105 acres were dredged to a maximum depth of 37 feet below mean sea level and 70 acres to a depth of 31 feet with slopes of 1 in 5. The total quantity dredged amounted to approximately 2,400,000 cubic yards.

In order to complete the reclamation approximately to schedule time, it was necessary to commence the dredging before the rubble dyke retaining walls were completed, and to overcome this disadvantage a bund was pumped behind and parallel to the dykes. This served to retain the filling and later, when the dykes were completed, the space between was filled and the whole finished to the required level and graded by hand. Consolidation of the

HAIFA HARBOUR — PALESTINE.

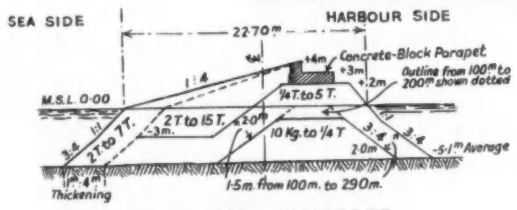
CONSULTING ENGINEERS;- MESSRS RENDEL, PALMER & TRITTON.



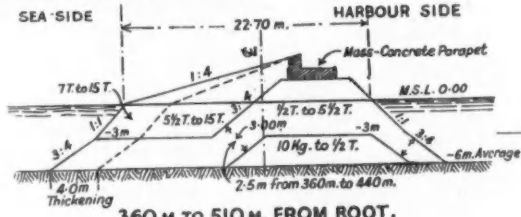
LEE BREAKWATER — TYPE SECTION.

Scale for Breakwaters
Metres 5 0 5 10 15 Metres
Scales for Transit Sheds.
Metres 10 5 0 10 20 30 Metres
Feet 20 10 0 20 40 60 80 100 Feet
Scales for Wharf Wall.
Metres 1 0 1 2 3 4 5 10 Metres
Feet 0 10 20 30 Feet

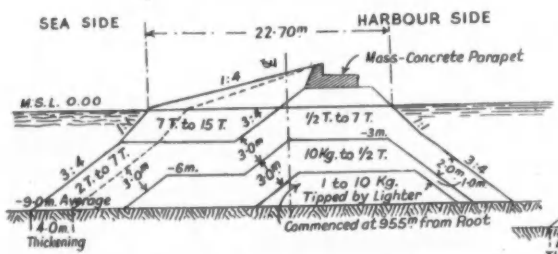
MAIN BREAKWATER SECTIONS.



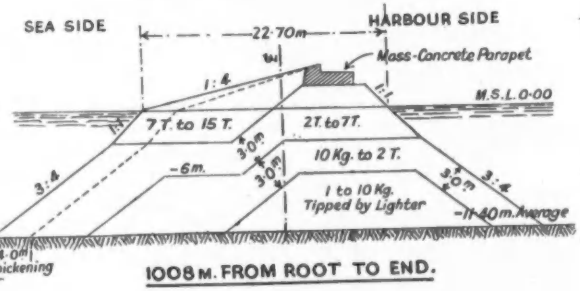
100 M. TO 360 M. FROM ROOT.



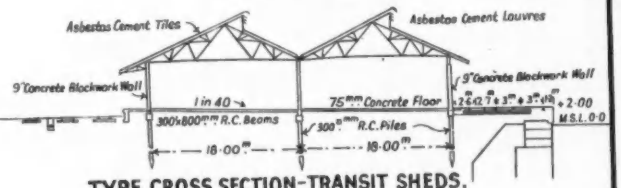
360 M. TO 510 M. FROM ROOT.



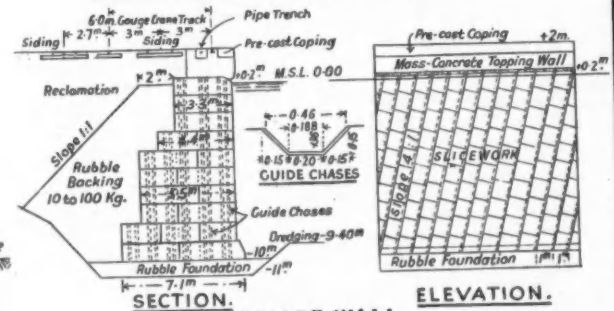
510 M. TO 1008 M. FROM ROOT.



1008 M. FROM ROOT TO END.



TYPE CROSS SECTION—TRANSIT SHEDS.



WHARF WALL

The Port of Haifa, Palestine—continued

pumped fill was very rapid, with no appreciable settlement, and this filling has proved an excellent foundation for the various buildings which were later erected on this site.

Transit Sheds

For the original scheme two transit sheds only were proposed. The sheds are steel framed with walls constructed of Winget concrete blocks, and owing to the uncertainty regarding the bearing capacity of the new filling, all foundations were carried on concrete piles. The floors were ramped from front to back, giving a 3-ft. railway platform at the rear. One of the sheds (No. 2) was constructed for future conversion into a double-storey combined orange-export and transit shed. The roof covering is russet-brown cement asbestos tiles.

Completion of First Stage of Harbour

On the 31st October, 1933, the Harbour was officially opened by His Excellency the High Commissioner for Palestine, Lt. General Sir Arthur Grenfell Wauchope, K.C.B.

In June 1933, following upon negotiations with the Iraq Petroleum Company, the Palestine Government decided to establish an Oil Dock within the harbour for the export of oil and also to provide certain facilities on the land adjacent. The Dock is sited at the eastern end of the harbour and adjoins the Lee Breakwater, and provision was made for a 20-acre tank farm by reclaiming a portion of the Bay east of the Lee Breakwater.

The Oil Dock is about 25 acres in area and is completely cut off from the rest of the harbour. It is enclosed on the west by a concrete jetty about 450 yards long, on the east and south by the Lee Breakwater and rubble dyke respectively, and on the north by a subsidiary jetty about 165 yards in length. The entrance, which is 353 feet clear width, is situated at the northern end, and can be closed in about 3 minutes by means of specially designed electrically-controlled floating boom, which is "housed" at the inner side of the subsidiary north jetty.

The dredged depth, below mean sea level, is 33 feet but the jetties and other works have been designed to permit of ultimate dredging to 35 feet, and it should be noted that the normal tide at this part of the Mediterranean seldom exceeds one foot. Two 20,000-ton tankers each about 500 feet long can be accommodated at the main west jetty and provision has been made for two similar vessels to be accommodated at jetties which can be constructed when required at the inner side of the Lee Breakwater.

General View of Oil Dock.

The total cost was £1,257,270, or only about one half per cent. over the estimate, but actually this cost covered work not included in the original estimate.

Extensions and Additional Works

Although the harbour was officially opened for traffic in 1933, less than 40 per cent. of the full development for which the harbour had been designed was then in operation, and various works and facilities have been added as the demand necessitated.

Of these the chief items were the construction of an Oil Dock and a Cargo Jetty, but other works such as additional transit sheds, open dumps, railways and roads have since been constructed, the principal works being completed at the end of 1938.

Oil Dock

When the lay-out of the harbour was being considered provsion was made for a site for an Oil Dock as it was then probable that a terminal of the pipe line from Mosul to the Mediterranean would be established at Haifa; but it was not until March 1931 that the probability became a certainty.

At that time a revised convention was carried out between the Iraq Government and the Iraq Petroleum Company which stipulated that a terminal was to be established in the Bay of Acre adjacent to Haifa and that the capacity at this terminal should reach a maximum of 4 million tons of oil per annum. The other terminal was situated at Tripoli in Syria.

The main jetty which forms the western side of the Oil Dock is a reinforced concrete structure, the total length, including a right-angled return at the outer end, being approximately 1000 feet terminating in a strong roundhead 67 feet in diameter. The concrete deck is 12 inches thick and 44 feet wide overall. The bents are spaced at 24-ft. centres and these consist of two 18-inch by 16-inch pre-cast reinforced vertical piles at 34-ft. centres transversely and with a central group of four raking piles driven to form a rectangular pyramid, the whole being rigidly connected to the concrete deck through a transverse beam 5-ft. in depth.

The longest piles were about 74 feet in length and all piles were jetted through the sand and driven into the clay and in some cases to the rock underneath.

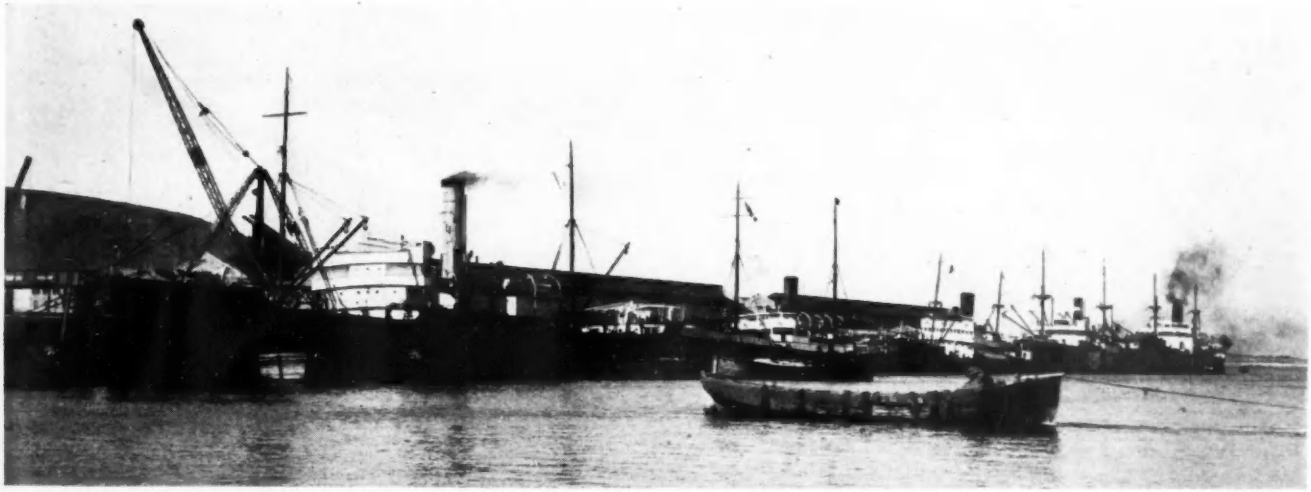
In the construction of the jetty a considerable saving was procured by eliminating temporary staging, the work being arranged so that it formed its own staging. The vertical piles were driven from floating plant and the practically tideless sea facilitated this arrangement. Temporary wire bracing was used to hold the piles in true position and the deck was then cast, suitable holes being left in the deck to permit of the groups of raking piles being driven through them. The structure was now strong enough to

The Port of Haifa, Palestine—continued

support the two raking pile frames which were specially designed for the work, and after the raking piles were driven each group of four was made monolithic with the deck by means of a large reinforced concrete cap embracing the pile heads and the transverse beam.

A fire screen consisting of a reinforced concrete fin runs the whole length of the jetty extending from 3 feet above to 3 feet below mean sea level and this, with the floating boom across the entrance, effectively seals off any surface oil that may collect in the dock and thus prevents danger from fire to shipping in the main part of the harbour.

In order to reduce the impact effect of vessels berthing at the jetty, eight spring buffers of special design have been adopted.



View of Quay Wall with five ships alongside.

Each buffer consists of a sliding steel frame which can travel in and out, the movement of the vessel being resisted by a series of volute springs. The frames are guided by vertical and horizontal rollers working in grooves, the whole arranged to be effective irrespective of the point of contact between the ship and the rubbing timbers of the buffers.

The buffers are 22-ft. 6-in. long and are arranged two or more to each berth and under working conditions have been found to be very effective.

The northern subsidiary jetty is of lighter construction as it serves primarily as the northern boundary of the Oil Dock and is not used by vessels. A roundhead has been constructed at the outer end similar to the one on the west jetty, leaving a clear entrance 353 feet wide.

In connection with the loading of oil into tankers, a small service area of about 3 acres has been fenced off on the reclaimed land at the root of the main jetty, and here the Iraq Petroleum Company Ltd. have established offices, fire-fighting plant, stores, boiler house and other necessary equipment.

About 500 yards eastwards on land reclaimed from the sea the company have a 20-acre tank farm enclosed within safety boundary walls, in which storage tanks, pump house and valve house have been erected. Each tank is surrounded by a concrete fire wall, the height of the wall being arranged so that the enclosed area can contain the whole of the oil from one tank, and as a further precaution against fire a safety zone about 40 feet wide is fenced off and surrounds the tank farm area.

The total cost of the Oil Dock, East Reclamation and ancillary works amounted to £253,300.

Cargo Jetty

Owing to the rapid increase in import and export trade, the Palestine Government decided in 1936 to increase the trading facilities, and for this purpose the Consulting Engineers proposed that a jetty should be constructed which would be equipped with cranes to deal with general cargo and also import coal.

These proposals were approved by the Palestine Government in April 1936, and after completion of the necessary drawings the work was put in hand.

From the plan accompanying this article it will be seen that the Cargo Jetty is sited parallel to and about 300 feet distant from the main west jetty of the Oil Dock, this intervening distance being utilised as a safety zone with the object of prevention of fire. The entrance to this area is closed by a boom and normally no craft of any kind or size will be allowed to enter.

All loading or unloading will be carried out on the side of the jetty furthest from the Oil Dock.

The jetty, which is constructed of reinforced concrete, is about 750 feet long and is capable of accommodating two moderate sized steamers such as usually call at this port.

The bents are placed at 22-ft. 6-in. centres and the deck width overall is 54 feet. The thickness of the main reinforced slab is 14 inches, but with the concrete filling to rail level the total thickness is over 19 inches.

The jetty is provided with

(a) Portal crane track 6m. gauge;
(b) A standard gauge (4-ft. 8½-in.) railway track;
(c) A double track consisting of a standard gauge (4-ft. 8½-in.) and a narrow gauge (1.05m.)

On account of the loads to be carried it was necessary to use larger piles than were used at the Oil Dock jetty, and they were made 21-in. x 19-in., but as a solid pile of this section would have been too heavy for the plant available, the piles were made with an elliptical hollow core, the axes of the hollow being 14-in. and 12-in. The vertical piles in the bents are spaced at 38-ft. 9-in. transversely, otherwise the construction is similar to the west jetty of the Oil Dock. In this case after the hollow piles were driven the solid head was cut off and a skeleton of steel bars was lowered into the hollow and the core filled with vibrated concrete. The result was thoroughly satisfactory.

Rail tracks were laid and mass concrete filling up to rail level was deposited and the deck completed.

The jetty is equipped with two 3-ton electric portal cranes for general cargo and they have been adapted for grabbing coal when this is required.

Concurrently with the construction of the jetty ancillary shore works were carried out including a large steel framed transit shed and road and rail connections to the Cargo Jetty area.

The total cost of the Cargo Jetty and the ancillary works referred to was approximately £152,500.

The Port of Haifa, Palestine—continued

Other Additional Works

Although the Oil Dock and the Cargo Jetty can be considered as the major works carried out since the opening of the first section in 1933, other important additions to the facilities have been made. These include two large Transit Sheds, No. 3 and No. 3 South, a smaller Transit Shed, No. 4, for the use of the lighter wharf, Port Office at the western end of the main wharf, Customs and General Office at eastern end, 5-ton portal crane to serve the lighter wharf open dump, and several other facilities of a minor character.

Shedding and equipment was added as required and at the time of the outbreak of the 1939-45 war, the following marine and shore facilities were available:—

General View of Cargo Jetty when nearing completion.

Marine Facilities

2 steam berthing tugs
89 lighters
56 launches
7 small towing tugs
1 water barge

Shore Facilities

Transit Sheds. Shed No.	Floor Area. Square metres.
1	4150.8
2	4150.8
3	3200
4	412.5
5	3668
6	2900
7	2060
8	2060
9	2060

Cranes

1—15 ton fixed derrick electric crane.
1—15 ton floating steam crane.
1—5 ton travelling steam gantry crane.
1—5 ton mobile petrol crane.
1—½ to 5 ton travelling electric crane.
2—3 ton travelling portal electric cranes.

1939-1945 War

Haifa became an important naval base during the war, being the principal naval port in the Eastern Mediterranean after Alexandria. When Alexandria became untenable following Rommel's invasion of Egypt in 1942, Haifa became the centre of naval concentration.

Throughout the war, all import and export traffic, military and civil, was concentrated on Haifa Port, as Jaffa was closed for security reasons. Over 6,000 vessels, excluding naval craft, entered and left the harbour, while 4 million odd tons of civilian cargo were handled in addtion to over 16 million tons of military traffic.

The port was raided repeatedly, particularly during the Syrian Campaign, but fortunately escaped serious damage.

Post-war Period

With the release of shipping for civilian cargoes and the inauguration of export drives by the industrial countries in Europe and America, Haifa is now being called upon to handle a flood of imports far exceeding in volume and variety anything experienced previously. Extensive building programmes; the construction of an additional oil pipe line from Kirkuk with terminal at Haifa; the possibility of Haifa Port being used as an outlet for oil from Saudi Arabia; and the doubling of the capacity of the refineries at Haifa, suggest that the level of traffic is likely to increase much beyond that now existing. The facilities of the port are already strained to their utmost and, with the development planned both in regard to Palestine and neighbouring countries, there is little doubt but that the capacity of the port will have to be extended appreciably. Tentative consideration is now being given to implementing the plans for expansion originally prepared by the Consulting Engineers at the time they designed the present layout. Immediate expansion, if decided upon, is likely to be in extending the oil dock as the volume of oil now being exported already exceeds the designed capacity of the port and a further substantial increase is expected when the second pipeline from Kirkuk now under construction is completed.

Peterhead Harbours Revenue.

It was stated at a recent meeting of the Trustees of the Harbours of Peterhead that the revenue for the nine months ended in November showed an increase of £5000 over the same period last year. It has been decided not to proceed with the extension of the white fish market on the west quay of the south harbour, and alternative plans have been drawn up for an extension of the quay adjacent to Harbour Street from the north end of the existing market.

The Transport Bill

Proposed Nationalisation Plans for Docks and Harbours

The following sections dealing with proposals as to the future of the harbours in Great Britain are contained in the Transport Bill which is at present being debated in Parliament:—

Clause 70.—(1) The harbours to which this section applies (hereafter in this section referred to as "trade harbours") are all harbours in Great Britain which are, or form part of, or abut on, harbours not normally used only by pleasure steamers, yachts, fishing vessels and vessels not required to be registered under the Merchant Shipping Acts, 1894 to 1940:

Provided that this section shall not apply to any harbour which is or forms part of a dockyard port within the meaning of the Dockyard Ports Regulation Act, 1865.

(2) The Commission shall keep the trade harbours under continuous review with a view to determining whether the powers conferred on them by this section should be exercised with respect to any trade harbour or group of trade harbours.

(3) The Commission may, in respect of any trade harbour or group of trade harbours, prepare and submit to the Minister a scheme for promoting, or facilitating the promotion of, the co-ordination of the provision of port facilities in or in connection with the harbour or group of harbours.

(4) Any such scheme may provide for all or any of the following matters, that is to say—

(a) for constituting or specifying the body or bodies who are to provide port facilities in or in connection with the harbour or group of harbours, and the body or bodies who are to administer, or take part in administering the scheme;

(b) for the transfer to any such body as aforesaid of the whole or any part of any undertaking, being an undertaking or part of an undertaking the activities of which consist wholly or partly of the provision of port facilities in or in connection with the harbour or group of harbours;

(c) for regulating the relations of persons providing port facilities in or in connection with the harbour or group of harbours, and, in particular, for the pooling of receipts or expenses;

(d) for specifying the port facilities which are to be provided in or in connection with the harbour or group of harbours, and for prohibiting or restricting the provision of port facilities in or in connection with the harbour or group of harbours otherwise than in accordance with the scheme;

(e) for incorporating, with or without modifications, in relation to any such body as is mentioned in paragraph (a) of this sub-section, any of the provisions of this Act relating to borrowing or the issue of stock, **including the provisions thereof relating to guarantees by the Treasury;**

(f) for incorporating, with or without modifications, in relation to any such body as is mentioned in paragraph (a) of this sub-section, being a body who are to provide port facilities in or in connection with the harbour or group of harbours—

(i) any of the provisions of Part V of this Act or of any scheme or regulations made thereunder; or

(ii) any other statutory provisions relating to or affecting the charges to be made by the Commission or the terms and conditions applicable to the Commission, whether for or in relation to the provision of port facilities or not; or

(iii) any of the provisions of the next succeeding section;

(g) for incorporating, with or without modifications, in relation to any such transfer as is mentioned in paragraph (b) of this sub-section, any of the provisions of this Act relating to transfer of undertakings or parts of undertakings to the Commission, including provisions relating to compension; and

(h) for making such other consequential or incidental provision as appears necessary or expedient for the purposes of the scheme, including provision for repealing or amending any previous scheme in force with respect to the harbour or group of harbours, or any part thereof, or for repealing or amending any statutory provision of local application affecting the harbour or group of harbours.

(5) The Commission may be the body specified, or one of the bodies specified, in a provision included in a scheme by virtue of paragraph (a) of the last preceding sub-section, and a part of the undertaking of the Commission may be the subject of a transfer under a provision included in a scheme by virtue of paragraph (b) of the last preceding sub-section.

(6) A scheme under this section shall not have effect until embodied in an order made by the Minister in accordance with the provisions of the Sixth Schedule to this Act, and the date on which it takes effect shall be such date as may be specified in the order:

Provided that where objection is made in accordance with the said Schedule to the making of the order and is not withdrawn before the making thereof, the order shall be subject to special parliamentary procedure.

(7) The power of the Minister to give directions to the Commission shall extend to the giving of directions to them to prepare and submit a scheme under this section with respect to any trade harbour or group of trade harbours specified in the directions, notwithstanding that the directions may be of a specific character.

Clause 71.—(1) The Commission may, by notice in writing published in the prescribed manner, direct in relation to any harbour which, or part of which, they have any power or duty to improve, maintain or manage, that port facilities shall not, to such extent as may be specified in the notice, be carried on therein or in connection therewith by any person except under and in accordance with the conditions of a licence granted by the Commission.

(2) Subject to the provisions of sub-section (3) of this section, any such licence may be granted by the Commission for such period and subject to such conditions (including conditions as to the charges to be made by the holder of the licence) as the Commission think fit, and may at any time be revoked by the Commission:

Provided that the Commission shall not refuse or revoke a licence under this section or impose any conditions thereon, unless, in their opinion, it is expedient so to do with a view to securing the better use of the harbour in the national interest or the economical improvement, maintenance or management thereof.

(3) If any person, being an applicant for, or the holder of, any such licence, is aggrieved by any determination of the Commission as respects the granting or revocation of the licence, or the conditions to be attached thereto, he may appeal to the Transport Tribunal, and the tribunal shall make such order as to the grant or revocation of the licence or the conditions which are to be attached thereto as they think just and proper in all the circumstances, and the Commission shall give effect to their order.

(4) If, while a direction is in force under this section with respect to a harbour, any person provides any port facilities in or in connection with it in such circumstances that a licence is necessary under this section, and he does so otherwise than under and in accordance with such a licence, he shall be liable on summary conviction to a fine not exceeding ten pounds, and, if the contravention in respect of which he is so convicted is continued after the conviction, he shall be guilty of a further offence and liable in respect thereof on summary conviction to a fine not exceeding ten pounds for each day on which the contravention is so continued.

Clause 72.—All property, rights, powers, obligations and liabilities of the Minister as successor to the Board of Trade in respect of Holyhead Harbour shall, on the appointed day, become the property, rights, powers, obligations and liabilities of the Commission.

Clause 124.—(1) In this Act, except so far as the contrary is expressly provided or the context otherwise requires, the following expressions have the meanings hereby respectively assigned to them, that is to say:

"dock" includes any pier, jetty or other place at which ships can ship or unship goods or passengers;

"harbour" means any harbour, whether natural or artificial, and any port, haven, estuary, tidal or other river or inland waterway navigated by sea-going ships, and any dock;

The Transport Bill—continued

" inland waterway " includes every such waterway whether natural or artificial;

" the Minister " means the Minister of Transport or the Minister of War Transport;

" port facilities " means the constructing, improving, maintaining, regulating, managing, marking or lighting of a harbour or any part thereof, the berthing, towing, moving or dry-docking of a ship which is in, or is about to enter, or has recently left a harbour, the loading or unloading of goods, or embarking or disembarking of passengers in or from any such ship, the lighterage or the sorting, weighing, warehousing or handling of goods in a harbour.

Statement by the General Council of British Shipping on the Transport Bill

The following pronouncement by the General Council of British Shipping has been issued for the information of the public:—

This comprehensive Government measure, the primary object of which is to nationalise rail, long distance road haulage and canals, also includes wide powers to bring the whole of the country within the scope of public ownership. This proposal to extend the principle of public ownership to harbours and port facilities is viewed by shipowners with grave concern. They believe that the centralisation of control in a small Commission of the whole and elaborate transport and port structure of the country will restrict economic development and stifle initiative; nor has any reasoned argument been advanced to show that such centralisation under public ownership will increase the efficiency of transport and of the ports.

The Shipowners confine their observations in the following memorandum to those parts of the Bill which specifically affect them, namely, those dealing with:

(a) Harbours and the varied commercial operations of the ports such as stevedoring, warehousing, lighterage, towage, etc., and

(b) Coastal Shipping.*

Attention is also drawn at the conclusion of this memorandum to certain constitutional considerations arising on the Bill.

Harbours

Shipowners deprecate the introduction of State ownership into dock administration. The wide powers given to the Minister of Transport by Clauses 70 and 71 over the whole range of ports in the country are misconceived and may do great harm to trade and shipping by disturbing the entire port structure.

The explanatory memorandum to the Bill states that its purpose is " to set up in Great Britain a **publicly owned system** of inland transport (other than by air) and **of port facilities.**

" Port facilities " are not confined to dock and harbour undertakings. They are defined in the Bill as including, *inter alia*, the constructing and maintaining of any harbour, the berthing, towing, moving or dry-docking of any ship which is in, or is about to enter, or has recently left a harbour, the loading or unloading of goods, and the embarking or disembarking the passengers in or from any such ship, the lighterage or the sorting, weighing, warehousing or handling of goods in a harbour.

" Any of these " Facilities " can be the subject of a " Scheme " by the Transport Commission, and that scheme can, if approved by the Minister and after being laid before Parliament, in effect nationalise all or any of them, or licence their operation in the hands of an approved number of persons or of some single monopoly. For example, in, say, London, Liverpool, or indeed any port, towage, stevedoring, master porterage, passenger ship tenders, warehouses inside the dock area, all, it appears, could be nationalised or put under some monopolistic system by virtue of this Bill and without the need for any further Act of Parliament. And all this could be done in addition to the taking over by the State of the whole undertaking of each and every port in the country.

Although there is no definition of " public ownership " in the Bill it is clear from the general context that this term must be read as implying State ownership, or at the very least, State control not only of all port, conservancy, lighting and buoying authorities, but also of the widely differing commercial operations within the ports. The Royal Commission on Transport in its final Report of December, 1930 (Cmd. 3751 of 1931—page 125) recorded the number of commercial harbours or ports in Great Britain at approximately 330 of which, apart from the 50 harbours under railway ownership, some 110 were operated by non-profit-making local Commissions or Trusts, 70 by Municipal Authorities and 100 under the control of private harbour companies or individuals. There is a marked and distinct difference between a " public trust " in relation to harbour administration and " public ownership " or State control as implied under this Government measure. For example, the constitution of the Port of London Authority as a public trust provides that the majority of its members shall be elected by shipowners and traders using the port and paying dues, wharfingers and owners of river craft. Without the adequate representation on the Authorities of the users of the ports there would be lacking the very interests most capable of infusing life and energy into their administration and of ensuring the adoption of a progressive port policy. In contrast, public ownership of ports as envisaged by the Bill is fundamentally inconsistent with their efficient management and the steady and progressive provision of facilities to meet the changing requirements of trade and of commerce.

Moreover, the application of public ownership to commercial enterprises within the ports such as stevedoring, lighterage, warehousing, which are in general operated on a competitive basis at the majority of the ports, including the public trust ports, would have far reaching detrimental results on the efficient handling of ships, and the loading, discharging and distribution of cargoes.

The Government have declared on many occasions that the policy of nationalisation will be applied only where beneficial results are likely to accrue. In the view of the shipowners there is no justification on past experience or in relation to the future trade requirements of the country for embracing the whole of the port structure of the country in the nationalisation proposals for rail, road and canals.

During the recent war years a measure of operational control of the ports was inevitable, but this could not have been achieved successfully if the Government in exercising their war-time emergency powers had not employed the services of those with wide commercial and port experience. But even then, it was found that once the Government had jurisdiction over port administration and operations, it was impossible for the departments concerned to confine their supervision to the plane of general guidance on policy; they inevitably became involved in the details of the day-to-day administration, which a central Civil Service is neither trained nor organised to undertake. Shipowners consider that to bring the port authorities and all the commercial operations in the ports under public ownership would be restrictive of development and of competition, would tend towards unwieldy monopoly and therefore increased cost, and would put the trading community at the mercy of arbitrary conditions.

As an illustration of the far-reaching consequences which may result from the exercise by the Minister of Transport and the Commission of the wide powers vested in them under the Bill, attention is drawn to the provisions of sub-clause (2) of Clause 3. This Clause, in effect, provides that all the undertakings operated by the Commission whether railways, roads, canals or harbours, shall form one undertaking which shall be financially self-supporting. Therefore the Commission, either on its own initiative or by a direction from the Minister, could increase the dues and charges levied on shipping and trade at the ports, in order to offset losses on the working of the railways or roads or any of their other undertakings; indeed the present efficiently run commercial services could be made to pay for the cost of loss of efficiency in port administration due to over-centralisation.

Paragraph 12 of the Explanatory Memorandum and Clause 70 sub-clauses (4) (d) and (7) of the Bill imply the preparation by

*The Section on Coastal Shipping is not reproduced as lying outside the purview of this Journal.

The Transport Bill—continued

the Commission (with or without direction by the Minister) of Schemes for the grouping of ports in particular areas. So far as shipowners have been able to trace, proposals which have been made for a measure of regional grouping have been based on theoretical considerations, and they are unaware of any convincing arguments or considered statements to show that the adoption of a general policy of regional grouping of ports would result in definite practical advantage to commerce or to the public interest. It is pertinent to note that the measure of unification recommended in the Report of the Clyde Estuary Committee (of which the Rt. Hon. Lord Cooper was Chairman) of December, 1945, was confined to a relatively small area, and did not include the grouping of all the ports in the Clyde Estuary. Shipowners do not suggest that reasoned proposals which *prima facie* suggest some advantage through the grouping of ports should not be examined, but, in general, they are unable to envisage any material advantages to be derived from a grouping policy. In their view, the adoption of such a policy would tend to sap local initiative and would destroy competition, factors which provide the best means of ensuring efficiency and economy of administration and of keeping port charges at a level calculated to attract trade. Certainly they would regard with grave apprehension the consideration of port grouping proposals under the powers given to the Commission and any Dock Executives, the declared purpose of which is to bring harbours and port facilities under public ownership. In this connection, the Royal Commission on Transport in its Final Report, to which previous reference had been made, did not propose the public ownership, in the sense of State control, of ports, and in expressing the view (page 134 of the Report) that Public Trusts were the best kind of Authority to own harbours and docks—

(a) they clearly had in mind Trusts similar to the present Port of London Authority and

(b) they did not recommend the absorption in one central or in regional authorities of all the commercial operations of a port as well as the dock and harbour undertakings as such.

Lest it be suggested that the Bill provides for adequate Inquiry before schemes promoted by the Commission in relation to harbours and port facilities are adopted it must be emphasised that the consideration of any such schemes cannot be divorced from the declared purpose of the Bill, namely, public ownership, and in any event, shipowners could not regard the nature and procedure of the Inquiries contemplated under the Sixth Schedule of the Bill as satisfactory. Furthermore, the application of the special Parliamentary procedure at a later stage of the consideration of harbour schemes of a controversial nature, still leaves it open to the Government to oppose the effective application of this procedure if they regard the adoption of the schemes as necessary in the national interest, or that sufficient consideration has already been given to them. (See House of Commons Hansard, Vol. 414, No. 19, Cols. 1937-80).

Shipowners regard the present time as the worst possible at which to disturb the whole structure of the ports of the country. The ports should be able to concentrate upon the task of promoting the Government's export drive, giving the quickest possible turn-round to ships and the greatest expedition in the handling of cargoes. If the Bill is passed in its present form with the prospect of public ownership in the minds of each Port Authority, a sense of complete uncertainty as to the future of the ports will discourage the pursuance of existing or prospective schemes of improvement and there will be a general reluctance to embark upon a large capital expenditure which may be of first importance to the rehabilitation of the ports after the war to meet the needs of present and future trade.

For the above reasons, and having in mind that the Government has no specific mandate from the electorate to bring harbours and port facilities under public ownership, Shipowners urge that **Clauses 70 and 71 with other relevant and consequential provisions** of the Bill dealing with

(a) Harbour Undertakings and

(b) the commercial operations within the ports—**should be omitted from the Bill.**

It is recognised that the future treatment of the railway ports will require early consideration if Parliament approves the nationalisation of the railways. Shipowners submit that the future administration of the railway ports should be the subject of a full and independent Inquiry.

Constitutional Points

Shipowners view with considerable concern the extent to which under the Bill it is proposed to leave wide powers with the Minister of Transport. To a substantial extent, the powers of the new Transport Commission are subject to over-riding directions from the Minister without further recourse to Parliament. Attention is drawn to some of these powers as follows:—

(a) The terms of the appointment of the members of the Transport Commission are entirely within the discretion of the Minister (Cl. 1 (3)).

(b) In framing programmes of reorganisation or development involving substantial capital outlay the Commission is to act on lines settled from time to time by the Minister (Cl. 4 (2)).

(c) The Minister may direct the Commission to discontinue any of their activities (Cl. 4 (5)).

(d) The Minister may withhold from Parliament the nature of any directions given by him to the Commission if, in his opinion, " it is against the national interest to do so " (Cl. 4 (7)).

(e) The setting up or subsequent abolition of Executives is entirely in the discretion of the Minister (Cl. 5).

(f) Similarly the establishment and subsequent abolition of area Transport Users Consultative Committees are entirely within the discretion of the Minister (Cl. 6).

(g) In exercising the wide powers given in the Bill for acquiring undertakings, the Minister may " modify or repeal any statutory provision, contract or document relating to the undertaking," *i.e.*, repeal all or any Acts and Orders relating to the railways, road transport, canals and ports (Cl. 7 (2)).

(h) For the purpose of considering objections to schemes of major reorganisation of harbours and port facilities the appointment of the " person " to hold the Enquiry solely rests with the Minister, and in turn, such person nominated by the Minister can exclude the hearing of evidence (Cl. 70 and Sixth Schedule).

(i) Notwithstanding any views held by the Commission on the desirability of such a course, the Minister may direct the Commission to prepare schemes of reorganisation or harbours or groups of harbours (Cl. 70 (7)).

(j) The Minister is given wide powers to vary existing statutory provisions relating to charges (Clauses 85 and 86).

Shipowners feel that these far-reaching and sweeping powers should on broad constitutional grounds be carefully examined by Parliament before the Bill is adopted in its present form.

Special attention is drawn to the powers to be given to the Minister under Clause 4 (7) of the Bill (paragraph (d) above) which shipowners regard as wholly inconsistent with the principles of democratic Government.

Port of Glasgow Exhibition.

An Exhibition, which has been organised by the Glasgow Art Galleries Committee and The British Council is being shown in the Art Gallery, Kelvingrove, Glasgow, from 20th December, 1946, to 7th February, 1947. The main part of the Exhibition will consist of photographs (including aerial views) taken by the British Council and giving a pictorial representation of the River Clyde, the docks, and of shipping on the Clyde from the Broomielaw to the Cloch Lighthouse. In addition to the photographic section, the Clyde Navigation Trust have kindly lent models of five of Glasgow's main docks. Maps will show the development of the river from 1800 till 1945, and a series of up-to-date models of Clyde River Steamers has been lent by various shipowners.

Notes of the Month

Rhine Shipping Control Discussions.

It was recently stated on the Stuttgart Radio that the question of the transfer of the control of Rhine shipping to a German central office is being considered by the British, American and French military authorities in Germany. Later, the discussions will be extended in order to cover the question of a central control of all inland shipping routes in the three Western Zones.

Refrigerating Plant at Port of Esbjerg.

It has been announced that plans for the modernisation of the refrigerating plant at the Port of Esbjerg have been prepared by Danish agricultural interests. The scheme will include a slaughterhouse, blood-albumin factory, and a laboratory where scientists will keep in touch with all modern developments in the utilisation of refrigeration for the benefit of the international foodstuffs trade. The new plant is estimated to cost about 8 million kr. and is intended mainly to act as a regulator on the exports through Esbjerg.

Czechoslovak Shipping.

The Czechoslovak Restitution Committee has taken over at Linz 16 of the 18 vessels freed by the U.S. occupation authorities. Representatives of the Czechoslovak Danube Navigation Company will take over a further 28 vessels. Three Norwegian ships totalling 6,600 tons have also been acquired, each having complete electrical and modern refrigerating equipment for the transport of foodstuffs. By means of these vessels Czechoslovakia will have direct connections with the seaports of the Black Sea and the Mediterranean.

Macduff Harbour Improvement Scheme.

It was intimated at a recent meeting of Macduff Town Council that the burgh has been successful in securing a grant from the Treasury of £46,820 for improvements to be carried out to the harbour. The improvements, which are to be commenced in the near future, include the deepening of one basin, improvements to quays and jetties, protection to the foreshore at the slipway, a new fishmarket and a new access road to the harbour. The scheme will greatly improve the harbour, which is claimed to be one of the safest and best on the Moray Firth.

Dredging of Irish Harbours.

Many Irish harbours have much leeway to make up in the matter of dredging. A few Harbour Authorities made an attempt to purchase small dredging plant, but most were dependent on the occasional use of hired dredgers. The cost of dredging has always been a big item in harbour budgets, and reduced revenue during the emergency resulted in a serious set-back to dredging operations. Arrangements are being made for a detailed survey of a number of harbours to determine the more urgent requirements and to plan a programme of regular maintenance dredging. Inquiries are being made abroad, with a view to the purchase or charter of suitable dredging plant.

Congestion at Cape Town Harbour.

The arrival within the space of a few days of a number of grain ships from South America caused considerable congestion in Cape Town harbour recently. The harbour staff of the South African Railways found it impossible to unload all the ships at the same time, and delays were unavoidable. Every effort was made to deal with the unusual concentration of cereal cargoes, even to the extent of introducing special measures. In one case maize was bagged on board—most of the cargoes arrive in bulk—and was railed direct to its destination. The congestion was due to the late arrival of some of the vessels chartered to lift maize and other cereals in South America. As a result ships arrived in a bunch, instead of at intervals. It should also be mentioned that the abnormal deliveries of cereals at Cape Town far exceeded the available handling facilities for this class of traffic, as the elevator system was not designed for the intake of imported grain on the scale of recent deliveries.

Increase in Suez Canal Receipts.

Suez Canal receipts amounted to £1,135,200 in October last, making £10,172,000 for the past 10 months, compared with £7,670,000 for the corresponding period of 1945.

Plans to Relieve Port Cargo Congestion.

Measures to relieve port cargo congestions, which are critical in New York and are becoming increasingly serious in other major ports of the United States, are now being discussed at the highest government levels, according to authorative sources in the export-import trade. Representations are now being made to the Secretary of the Treasury for an immediate increase in the funds allocated to customs authorities in order that they may hire sufficient skilled personnel to handle rapidly the increased flow of goods.

Termites at the Port of Sydney, N.S.W.

An unwelcome visitor to Sydney recently was *Mastotermes darwiniensis*, a large and destructive species of termite from Northern Australia. It was discovered in the timber casing of service stores returned from Darwin. This voracious termite has been known to destroy such substances as lead sheathing, bitumen, paper, bone, ivory, horn, leather, hides, ebonite, asbestos, flour and sugar as well as timber structures and is considered to have caused more economic loss than any other insect in Northern Australia. The arrival was dealt with in an appropriate manner.

Standardised Loading Device.

A San Francisco manufacturer has developed a standardised form of pallet or stillage for use with stacking trucks, designed to receive merchandise at its source and to carry it as a unit load throughout its journey to destination. Nation-wide distribution is to be arranged, and the pallets will circulate freely among hirers, wagon loads of them being delivered to users at regular intervals according to needs. Constructed of wood, and weighing approximately half a hundredweight each, the pallets measure 40-in. by 48-in., and can be picked up from all four sides, provision being made against racking strains. Their capacity is one ton.

Proposal to Modernise Quay at Newcastle.

It is announced that the Newcastle Corporation Trade and Commerce Committees has decided to modernise a stretch of its quays west of the existing deepwater quays at the Ouseburn. Details of the contemplated improvements have not yet been worked out, but they will include the modernisation of some of the cranes and cargo handling facilities and the improvement of the existing railroad. This stretch of quay, which is mostly used by coastwise Continental and Scandinavian traffic is part of the original quay, and has not the facilities of the modern extension of the deep water quays. The scheme will be subject to Government approval for a loan to carry out the work and for the necessary licences, for labour and material. It is not expected that any immediate development is likely.

Rehabilitation of Ports of the Dutch East Indies.

At the conclusion of the war, the harbours of the Dutch East Indies were found to be in a state of devastation. Large areas were covered with collapsed or badly damaged sheds, berths were blocked by sunken ships, and cranes and other equipment were missing. Within the last few months repair activities have started at Macassar, Tandjong Priok, Soerbaya and Menado, and as far as the big commercial ports are concerned, plans have been drafted for repairs and extensions involving an expenditure of over fl. 66 millions. The rehabilitation of the ports is expected to take eight years, but already the situation has improved appreciably. Extensive dredging is necessary, and measures have been taken with a view to speeding up the construction in Holland of the dredgers required.

Port Operation

The first of a series of articles by A. H. J. BOWN, M.Inst.T., A.C.I.S.* and Lt.-Col. C. A. DOVE, M.B.E., M.Inst.T.†

I.—The Aim of the Series

IT has been suggested to us on behalf of young men studying for the examinations of the Institute of Transport that there is a present need for up-to-date material which such students may use as a basis upon which to exercise their minds. We have made enquiries and we believe that the suggestion is well founded. Further, we have consulted with each other and with our more candid friends and, as a result, we have accepted the invitation to collaborate in a series of monthly articles which will deal with the subject of port operation.

Had the task been indicated to us in loftier or more learned terms, we should probably have asked to be excused. But, put to us as it has been—that is, an appeal for a helping hand for our younger colleagues in the port industry—we propose to write down for them what we know, what we have seen and—occasionally—what we have concluded from what we know and have seen. Between us, we have seen a fair number of British and foreign ports: and we have both earned a living, for many years, in association with the business of port operation. Another of our homely qualifications is that once, in the rapidly receding past, we were both earnest young students of the Institute of Transport; and yet another is that we are still learning about the industry and still aware of our need to learn. In other words, we know what it feels like.

Throughout the series, we propose to keep one eye glued upon the syllabus of the Institute of Transport. As there are two of us, and we each have the normal optical equipment, we feel we can spare a quarter of the combined battery for this important task. Before the series is concluded, we hope to provide material upon which any candidate might have founded reasonable answers to the questions set in the Institute's past examinations for Associate Membership. We regret we cannot extend this guarantee to cover all future examinations—but we shall do our best. We shall set down what we conceive to be the principles of port operation; and we shall discuss them and enlarge upon them according to our knowledge, experience, reading, capacity for research, the patience of our friends, and the space at our disposal.

We do not suppose we shall write anything new; but we shall hope, at least, to present established and accepted knowledge in a new way, with some up-to-date examples, and in a new arrangement; and always with that one eye steadfastly turned in the direction already indicated. In fact, the only difference between ourselves and Mr. Bunsby—that intrepid master mariner—is that whereas he had " one stationary eye and one revolving eye—on the principle of some lighthouses " (if we remember our Dombey and Son) we shall be triple-powered in the revolving department.

Neither do we suppose that in eleven or twelve articles we shall be able to tell the student all that he should know—even for the rather limited purpose of securing a pass in one paper of one examination. Our immediate aim is lower—but our ultimate purpose is much higher. We shall give a good deal of information about port operation, but we shall be constantly recommending further reading and investigation by the student himself in directions which we shall strive to indicate. We shall try to encourage students so to equip themselves for their jobs that examinations become pleasant, incidental exercises and stepping-stones to useful careers. In saying this, we are not forgetting that an examination looming ahead can be a great worry to a young fellow, particularly if he is having to travel uncharted territory—or if, where charts exist, nobody seems inclined to lend him one or to tell him where to get one. We have undertaken to do what we can, in this series, towards removing that worry.

It seems important to us to say, in this introductory article, that we fully realise we are very far from being pioneers in this important field. Distinguished and able men have preceded us; and, as occasion arises, we shall direct the attention of our readers to what has already been written on particular aspects of port operation.

As mentioned above, we shall write primarily for students, and, in order to be lucid, it is inevitable that we shall sometimes be elementary. Indeed, we may sometimes take a lot of pains to state the obvious if we feel that it may possibly not be so obvious to those with whom we are principally concerned. Nevertheless, we venture to hope that here and there, in the course of our series, we may possibly engage the interest of some who have passed the student stage. We have particularly in mind the man in a port undertaking who has spent a number of years engrossed with a particular section of the work and has never had—for one reason or another—the time or the opportunity to learn enough of the other fellow's job to enable him to appreciate his own task as part of a co-ordinated system. We may fail to achieve much in this direction, but, here again, we shall do our best.

In addition to students and perhaps some of the older men in the port industry, we dare to think it possible that some members of the general public may find interest in the articles we have been invited to write. It is our experience that eminent professional men, industrialists, teachers and other important citizens sometimes ask the question " How are ports worked—and who does it? "—and often they do not receive an answer. We are going to give an answer. It will only be our answer, and therefore only a partial answer. There will be plenty of room left for a lot more answers. But we are certainly going to write down how some ports are worked by some people in some places.

We wish to give preliminary warning that we do not imagine ourselves as two great minds about to unfold a profound and awful mystery. We believe that dock operating is very largely common sense; and that most of the rest of it consists of matters of opinion. We shall try to show how the common sense is applied in practice; and when dealing with disputable points we shall endeavour to state all sides. If we happen to have a personal predilection in any such matter we may modestly indicate our preference, giving our reasons.

After all, we are only going to set forth the available information regarding the business of getting ships in and out of ports, getting goods and people in and out of ships and getting goods and people on and off docks. We are therefore not over-awed as we sit down to our task and we earnestly ask the student to approach the matter in the same way. We think there is quite enough pretence in the modern world without port men concerning themselves to impress the public with the abstruse nature of the work they do.

Just as we entertain the hope that we may possibly write something of interest for the man who is a small cog in the vast machine of a large port, so also we may be able, here and there, to be of some help to the man who is the king pin in the simpler organisation of the smaller port. There are certain problems which present themselves alike to the piermaster at Sandycove and to the general manager of a world terminal; but the piermaster may not have considered all the adjustments in working that become necessary when annual tonnage, capital investment, maintenance charges, length of railways, size of the estate and volume of output, all rise to very large figures. In a word, we feel that the small port operator may care to read something about large port operations, and we shall therefore keep him in mind.

The Institute of Transport is at one with the writers of standard works on port matters in making a clear-cut distinction between port operation, on the one hand, and port economics on the other. For our part, we have been asked to deal with port

* General Manager and Clerk, River Wear Commissioners; and General Manager, Sunderland Corporation Quay;
† Late Embarkation Commandant, Calcutta.

Port Operation—continued

operation. But we may stray. "Candour compels fur to admit"—as Joe Gargery used to say—that the line between operation and economics is but faintly traced in the minds of many. Dare we, indeed, suggest that the precise nature of port economics is not always perfectly apprehended May we, after this cautious approach, go on to say—with a view to being on the safe side—that we have ourselves looked into our modern dictionary and are comforted to find that one of the oldest and friendliest of definitions is still in fashion —"Economics is the science of household management." Now everybody knows that "port" is Latin for "gateway," and therefore port economics is simply the science of household management as applied to gateways. A competent household manager is frugal but not mean, a careful balancer of budgets, capable of planning ahead, resourceful in a crisis, a believer in order but not a slave to rules, tidy but not fanatical about it, a good picker of assistants, industrious but averse to needless drudgery, a neat hand at repairs but only if the article is worth it, something of a diplomat, a bit of a dictator and always a friendly neighbour. That is not the description of the ideal traffic manager—but it goes close. Certainly every traffic manager has to do some thinking in terms of economics. But we presume the distinction is to be drawn between the traffic manager when he is operating his dock estate, and the traffic manager when he is thinking over his problems of administration or discussing them with his general manager. We shall bear that distinction in mind but if it should now and again appear that our ideas on operations are coloured by our thoughts concerning high-level administration, we trust that the ideas may not be any the worse for that.

Manifestly, in discussing operations we shall have to refer constantly to the operating tools and the layout of the operating theatre. It is, of course, perfectly possible to carry out port operations with some sea, a piece of sheltered beach, a ship, some cargo and a few human beings. To these basic essentials, however, the passage of time has added lighthouses, beacons, piers, wavetraps, dredged channels, dock gates, locks, piled quays, cranes, elevators, harbour working craft, tipplers, railways and rolling stock, warehouses of all kinds, chutes, hoists, transporting gear—and the National Dock Labour Corporation. In modern times, the port operator cannot begin to operate until the civil engineer, the mechanical engineer and the electrical engineer have all done their best for him. Very often, he cannot go on operating very long until one of them comes back and does some of it for him over again. For their works are many and marvellous—but they break down now and again. Also, they wear out and must be repaired or replaced. It is proper that in introducing a series of articles on port operation, we should explain that we are not qualified to discuss the technical details of port construction or of dock equipment. All the traffic manager requires to know about an appliance is its first cost, its working cost, its purpose, its speed, its probable life, how to get the best out of it and how it should be treated to preserve it in good order. To adapt the poet, a quick-acting, level-luffing crane by the river's brim, a simple quick-acting, level-luffing crane is to him. To the engineer, it is, of course, something more. So we shall often talk about appliances but always from the point of view of those who have to use them.

It will be very evident to any responsible port official who has read thus far that if we are to make our projected series of articles really helpful to the student, they will need to be factual, authoritative and up-to-date. In order to make them so, we shall ourselves stand in need of much help and it is our intention to seek it from all port general managers and traffic managers who are willing to give it. We therefore take this opportunity of mentioning that from time to time we shall be approaching the managers of a number of ports, inviting their views on operational matters and perhaps, in some cases, asking for permission to visit their ports in order to inspect their layout and to hold discussions on the spot. We shall be asking for this sort of assistance in the name of Institute students—many of whom are but recently returned from years overseas in the fighting Services and are anxious to resume their interrupted careers. We believe, therefore that we shall not ask in vain.

We have tentatively settled the general lines and sub-divisions of the task before us and we have set out below the main heads and our proposed order of approach. But we are not bound by it, and we are very ready to accept advice upon it from any interested person who has alterations or additions to suggest. And it is not only from port managers and dock managers that we now invite such comments. We will gladly consider the ideas of students on the matter, if it seems to them that there are gaps in our synopsis which require filling in.

It is our hope that local sections of the Institute of Transport may find opportunity to dissect and discuss our articles at their Section meetings. It seems to us that all such debate is bound to be helpful to students during the period of their examination training and that it might also be useful to others. Certainly, such discussions will be useful to us in our endeavours to set forth the sort of information students want.

It has been suggested to us that in this introductory article we should offer some recommendations to students on methods of studying. As we turn this solemn thought over in our minds we are a little reminded of Dr. Johnson's old friend who had "also tried to be a philosopher but cheerfulness kept breaking in." We think, too, of the famous Squeers method of study—"W-i-n-d-e-r winder—and then he goes and cleans it." You can study by reading, and by writing, and by discussion, and by looking at things. You can study by making things—a model discharging berth, for example, or a model dock railway layout. If you have no skill at model-making, perhaps you can draw. You can learn a lot about port operation by making experimental plans, charts and diagrams.

On the negative side, you cannot study anything if you are not interested in it. If these words are read by anybody who is wondering whether he ought to begin the study of port operation we urgently recommend him to borrow a few pounds and start a garage or to send for some literature on farming in Rhodesia. For if he is interested in port operation he will not be wondering about it, he will have started studying it; and if he is not interested in it, it is no good pretending to study it.

The best form of study by writing is note-making. More highly successful students are probably made by good note-making than by any other method. Every student must make his own note books—it is almost useless to copy them ready-made from a fellow-student. They should be scrupulously neat and well-kept and therefore a pleasure to use in revision work. In making his notes, the student should condense, tabulate and summarise at every opportunity. The "family tree" device is often valuable in showing clearly and fixing in the memory the inter-relation of the different sections of a system or a subject. The material for the student's notes should be drawn from text-books, technical journals, the newspapers, lectures, discussion with experts, and observation. The note-book proper should be written up carefully and at leisure and is not to be confused with the rough "jotter" carried in the pocket for immediate, occasional use. The use of loose-leaf binders, hand-printed headings and different coloured inks all add to the permanent value of good note-books. First-class teachers often claim that if they can inspect a student's note-books before an examination they can predict his chances of success in nine cases out of ten. We commend this thought to all students.

Another important point in studying a subject like port operation is to study something else as well—something vastly different such as sketching, ski-ing or skittles. If a student omits this, he is likely to become unhealthy and therefore unhappy; and then he will cease to be a student; and, ultimately, if he persists, he will cease to be in any sense whatever.

The articles to follow deal with the under-mentioned sections of the subject in the order shown:—

(1) The organisation of ports. The functions, separate responsibilities and inter-relationship of the principal bodies normally concerned in port operating. The Port Undertaking and its Departments. (Two Parts).
(2) The design and lay-out of ports.
(3) Equipment and appliances. Choice. Operation. Problems.

Port Operation—continued

(4) Cargo handling. I—General. Loading Discharging. Transfer and transhipment of cargoes. Connection with inland services and avoidance of traffic congestion.
(5) Cargo handling. II—Office control; Commercial, financial, and administrative routine involved.
(6) Dock labour. Supply and control. Problems.
(7) Passenger traffic working. 1—Facilities to be provided and arrangements for inland communications.
(8) Passenger traffic working: 2—Customs formalities and requirements. Baggage handling. Arrangements for immigrants and quarantine.
(9) Miscellaneous matters (a few paragraphs on each):—
Free ports.
Bonded warehouses.
Radar in port operation.
Turn-round.
Safety measures.
Hygiene.
Statistics and graphs as tools of management in ports.
(10) Inland water transport operation. Methods of co-ordination with other forms of transport. Systems of traction. State requirements in relation to equipment and costs. Labour problems.

(To be continued)

Legal Notes

Accident to Stevedores at Liverpool

On the 9th December last, Mr. David Wilson Murphy, stevedores' foreman, of Mulberry Grove, Wallasey, appeared before Mr. G. Glynn Blackledge, the Liverpool Stipendiary, on a charge that on November 2nd, 1946, he contravened the dock regulations in that a beam of a hatch during work was not removed or adequately secured to prevent its displacement. He pleaded not guilty.

Mr. H. Hudson, H.M. Inspector of Factories, who prosecuted, said Murphy was employed as a stevedore foreman by Scruttons, Ltd., a firm of Liverpool stevedores, and on the morning of Saturday, November 2nd, he was in charge of the work of unloading a cargo of bacon and potatoes from the *Saxon Queen*, in the South West Prince's Dock, Liverpool. Unloading began on the Friday and was resumed next morning, when nine men were sent to work at No. 2 hatch, and there were three men on deck, the winch driver, the signaller and the guy-man. The cargo was at the extreme end of the hatch; No. 6 beam was left in position. The beam, with the hatch covers, should either have been removed or adequately secured to prevent displacement, but nothing was done. Murphy was in charge, and gave no instructions about the beam, and when an accident occurred he was not on board the vessel. At 9.15 a.m. a further gang of six men were sent to the ship, and there were then 12 men working below in a restricted space.

A signal was given to raise a load of potatoes and, while it was being raised, it was noticed the hook on the edge of the fall caught on the under-side of No. 6 beam. The alarm was immediately shouted and the winch driver stopped at once, but not in time to prevent the beam being lifted out of its socket. It balanced for awhile on the end of the socket and then crashed into the hold, the hatch covers falling down among the men. Several men were knocked down, and one man, Joseph Grisdale, was so seriously injured that he was removed to hospital and would be prevented from resuming work for a considerable time.

Mr. R. S. Nicklin, for the defendant, submitted that the only responsibility on the foreman was in so far as he was employed in the process of unloading. It would be going too far to say the winch man was responsible for seeing the pin was secure, and he suggested Murphy was no more responsible than anyone else in regard to the pin. In connection with the process of unloading, Murphy's first job was to get the gangs, and to do this he had to go to the controls. His duty was to lay on the gear and the men. He could not be expected to go round and see every pin was in position. He had not, in fact, started on his job of supervision in the ship when the accident happened. He was in the first instance engaged in his employment of getting gangs and gear. He therefore submitted that this was not a case where an example should be made of Murphy.

Judgment

The Stipendiary said he found the case proved. It was very important that the prosecution should have been brought against someone in order that matters might be fully inquired into publicly. Clearly, when men were working in a hold, it was vital that the regulations should be complied with and that all the hatches should be secured or removed, because of the danger to those working below. The person on whom the responsibility mostly fell was the foreman in charge of the ship or the hatches. In working conditions, it was difficult for the foreman if he had to engage gangs and also dash round the ship looking to the pins as the work was commencing. At least, that difficulty might excuse a lapse of mind on the point. Personally, he took the view that one foreman in the particular circumstances of the case might have considerable difficulty in doing this duty as well as laying on his gangs.

He could not help thinking that there ought to be some sort of deputy either appointed by the firm or deputed by the foreman to do the job of looking at the beams. If that was done, some accidents could be prevented. Apparently no one seemed to have that duty. It was the duty of each of them, but because there were so many men working there each individual would think the responsibility would not fall on him. "This is, I understand," said the Stipendiary, "one of the first cases of its kind, and it is brought in order that publicity can be given to what has been said."

Murphy was discharged under the Probation of Offenders Act, and, on the application of Mr. Hudson, was ordered to pay costs amounting to £3 1s. 0d.

Economy in the Use of Paint

The Ministry of Works, in collaboration with other Government Departments, has recently issued an economy Memorandum on the use of paint in building construction and maintenance. Severe restrictions on the use of paint are necessary because of the acute shortage of linseed oil and other raw materials, and the Memorandum shows how these economies can be made.

While paint, to the lay mind, connotes decoration and freshness, to engineers and industrialists it is a necessity to ensure the preservation of structures. The short supply of raw materials has caused the paint manufacturers to institute researches into the possibility of substitues, and among those which have so far found uses are, dehydrated castor-oil, cashew nut oil and petroleum residues. The resulting paints, however, do not dry so readily as linseed oil paint any they mostly leave a sticky surface which makes them unsuitable for engineering uses. Owing to the small amount of maintenance work possible during the war years many structures are now in urgent need of a thorough scraping and painting, and only the best linseed oil paints can be considered really suitable.

Failing an adequate supply of this, the best alternative is a tar varnish for work where durability is of more value than decoration. It is recommended where the metal surface is exposed, to first apply a priming coat of red lead, which is the old stand-by of marine structures. The susceptibility of iron and steel to corrosion in a maritime environment renders it all the more necessary to see that the surfaces of structures located therein are adequately protected, and as there seems to be little prospect of an early sufficiency of linseed oil, it would appear to be a judicious move to treat neglected structures without delay with tar varnish.

It is pointed out in the Memorandum that in using fewer coats of paint, better results are obtained by using darker colours instead of white and light tints. Moreover, opaque white pigments are also in short supply. Cement paints, silicate paints, tar, tar paints and wood preservatives are all in good supply and may be used without restriction.

Fenders and Dolphins

By R. R. MINIKIN.

Simple Fendering

WHEN a harbour engineer, who has an extensive wharfage line under his supervision, makes out his estimate for maintenance repairs, he frequently feels professionally challenged by circumstances to devise a form of fendering for his jetties, which shall be more effective than any he has yet tried. There is always the minor damage: the proud edges of ship's plating, the hinges of cargo doors, etc., foul portions of the structure. Thus rubbing strips, lightly secured and easily replaced, are invariably fitted; but unfortunately, over a period, there is almost certain to be some major damage. A vessel comes alongside, and by some odd circumstance, which is seldom clearly demonstrated afterwards, carries away some fender piles: rips off the walings; or damages the main supporting piles. Besides these

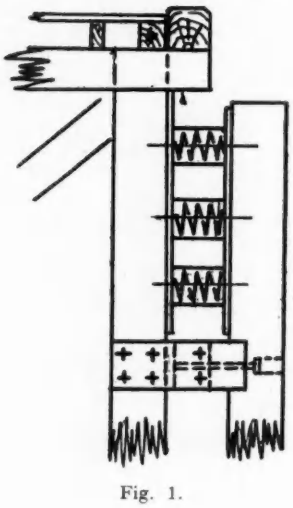


Fig. 1.

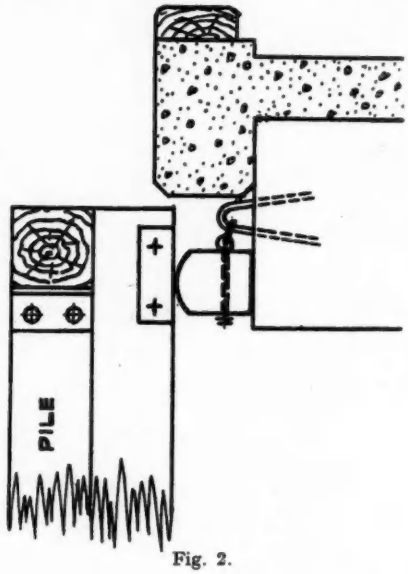
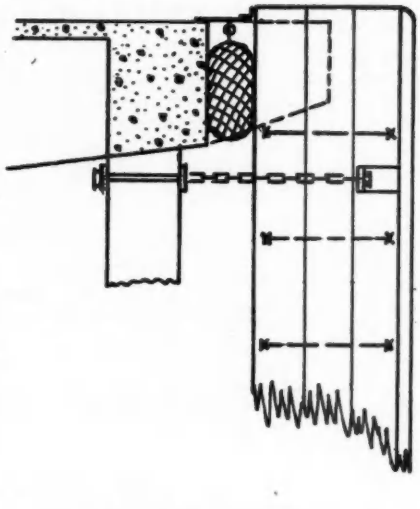


Fig. 2.



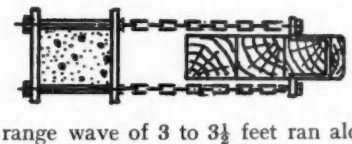


Fig. 3.

there are the fendering members which have done heavy duty over a considerable time and have lost their effectiveness. So then in the endeavour to reduce the amount of these repairs and replacements the engineer is beset with a recurring problem.

As a general rule in this country the main structure is sturdy enough for its duty, providing it has the resilient protection of a given amount of fendering. Thus the economic problem of maintenance resolves itself into: what form of fendering will give the most efficient service under the given conditions? Let us then draw upon the experience and developed practice of successful engineers in busy harbours.

At the outset it will be generally conceded that the most efficient fendering material from the economic and structural standpoint is timber. Most engineers who have had experience of this and other materials will agree. Nevertheless, as we shall see later, there are limitations to its use. The simplest form of fendering is the isolated timber pile driven about 2-ft. 6-in. in front of the jetty, with the head of the pile at about deck level. In Continental ports these are very common and the heavy duties they support is surprising. At Ostend the cross channel steamers frequently occupy the one berth two and three times a day the year round. They are vessels of 3-4,000 tons and berth under their own power, stern first. They are most skilfully piloted and but seldom are the fender piles damaged even with a half-metre range wave running alongside. At Bremen similar piles for casual berthing of vessels of similar displacement have lasted for 20 years. The best results seem to occur with 14-in. square section in maximum water depth of 20-ft., spaced 7-ft. 6-in. to 10-ft. centres and driven 12 to 15-ft. into compact soil, sandy clay, sand, or gravel.

An improvement on this type of fender is claimed for the single pile driven at an outward rake (that is where the head of the pile is at a greater horizontal distance from the jetty than the toe) and the head pulled in towards the main structure and anchored. This results in an initially stressed and bowed pile, providing it is driven deep enough into firm strata; with the convex surface towards the vessel. On impact, it acts like a spring under the blow. In a particular case 12-in. by 12-in. piles, of this type were driven at 5-ft. centres and the heads connected by stout walings, to protect a jetty run out for half a mile in the open sea. For most of the year a range wave of 3 to 3½ feet ran along the jetty. In spite of the fore and aft run and berthing impacts, these piles in 24-ft. of water have given excellent service to vessels of up to 2,500 tons displacement without major mishap.

The timber verticals placed on solid quay walls and on cylindrical pier jetties are not fenders so much as rubbing strips. On impact, only the compressibility of the timber is called into play and not the spring value or the resilience of the material under bending. In the same category is the floating boom, or catarmaran, if placed directly alongside a quay wall. The combination of the two however, that is, projecting vertical timbers and a floating boom, form a fendering system, for not only is the blow on the boom distributed over a length of quay; but the resilience of its members is mobilised.

Most attempts to use rolled steel pile sections as fendering have not been successful. The lack of resilience causes the material to dent and buckle under repeated blows, even when protected by timber rubbing strips.

Spring Reaction Fenders

Where larger vessels are berthed and there is the likelihood of heavier blows an expedient to increase the amount of give, and at the same time reduce stresses in the fender pile, is supplied by the insertion of some sort of spring between the jetty and the head of the pile. These springs may be rubber buffer blocks, rope coils, cork and rope fender, steel buffer spirals or laminated steel

Fendert and Dolphins—continued

springs. To make these springs effective the fender pile scantlings, in the body, must be sufficient to transmit the force of the blow to the springs without fracture. For example, three buffer springs, enclosed in leather casings, Fig. 1, support the head of a 12-in. by 12-in. fender pile held in position by two ¾-in. thick guide plates and a 1-in. diam. stop bolt. The spring value at the head of the pile is then 9 tons per 1-in. compression, assuming each spring to give 3 tons resistance for 1-in. compression. It is obvious that a 12-in. by 12-in. pile would not have such a large head reaction if it were long, and the blow was delivered many feet below the centre spring. Thus the design shewn would only be effective if the contact point was near the springs and even then at the value given the spring value is too high. The system would be more efficient with one spring, giving a deflection of 15 tons for 5 inches. The alternative is to increase the scantlings of the fender pile.

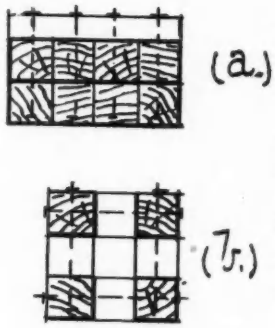


Fig. 4

For jetties in waters where the tidal range is low, and in wet docks, the design shown in Fig. 2 is suitable for vessels up to 8,000 tons. A rubber buffer about 12-in. square is inserted between the jetty and the fender pile. The tops of the fender piles are connected by timber walings and the head of the pile strengthened for one third of its length with a timber of equal scantling bolted to the back. Such piles in 35-ft. of water may be 12-in. sq. provided a substantial floating boom is also supplied. The rubber blocks have a spring value of 4 tons per inch compression.

Multiple Fender Piles

For heavier duty in a tideway, for vessels of 12,000 tons displacement, the form shewn in fig. 3, used with a floating boom has given satisfaction. The fender piles are spaced at 20-ft. centres, and are built up of 3 baulks of Oregon pine 14-in. sq., faced with 6-in. Rock Elm rubbing strip. The head of the pile is housed in a cavity of the concrete deck and is chained back to the vertical supporting leg of structure. Between the head of pile and the jetty a rope pad is placed, slung from the cover plate. These fenders have proved satisfactory, though the rope pad requires periodic renewal.

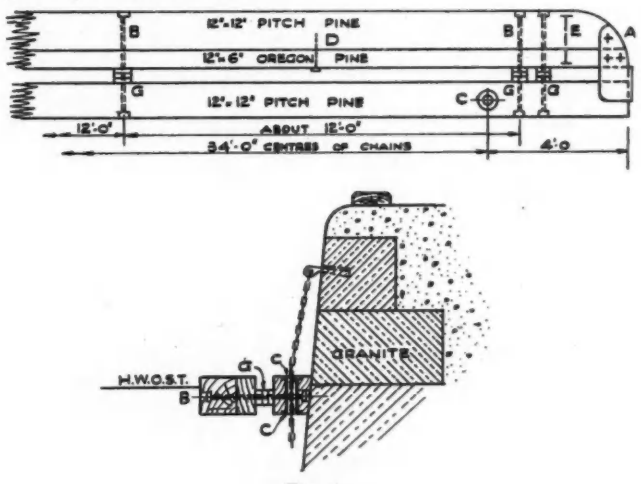


Fig. 5.

Another type of multiple pile timber fender is shewn in fig. 4a. A closed group of eight 12-in. sq. piles are driven into the river bed and connected together by a timber riband at the back. The head is supported against the jetty deck. The groups are about 30-ft. apart for vessels up to 4,000 tons displacement. They have been used satisfactorily for Thames side coal discharging jetties at power stations.

In this connection the author, some years ago, made a suggestion* that multiple pile fenders should not be closely driven but be disposed as shewn in fig. 4b. Such a disposition not only increases the strength for bending but ensures a considerable elastic resistance from the ground at the toes, and introduces a useful, if not considerable, couple in the vertical plane to resist the force of the blow. The four corner piles are separated by distance pieces, arranged as a cross, and are through bolted as shewn.

Cushioning Fenders

Alongside solid quay walls and heavy rigid jetties, not provided with resilient fendering, vessels have been subjected, at times, to various forms of damage; denting of plates, springing of rivets and to the ship-masters great annoyance the scraping off of paint. In consequence some shipping companies, which use regularly particular berthing spaces, insist upon the provision of special forms of cushioning fenders. At Southampton, the Nord Deutscher Lloyd used large bundles of brushwood of special design.

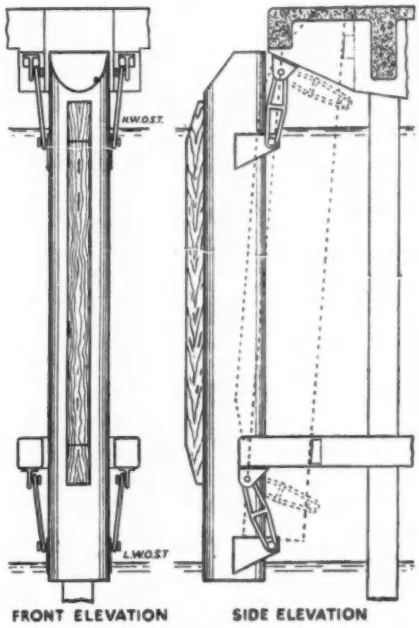


Fig. 6.

Around a central 6-in. diameter steel tube with flanged ends, natural straight unsawn branches of timber were wired, to form a finished bundle of about 3-ft. 6-in. diameter, for large liners. The procedure of manufacture is to first make up bundles of about 1-ft. 9-in. to 2-ft. diam. with flexible wire bindings at about 3-ft. spacing. Then 4 bundles are placed around the tube and squeezed in to finish about the required diameter. (For a finished 2-ft. diam. fender, 4 bundles of 1-ft. 3-in. diam. mounted on a 4-in. diam. tube gives satisfactory results for vessels up to 15,000 tons). The final wrapping of the fender consists of about 8 turns of 2½-in. flexible steel wire at 3-ft. spacing.

The fender is then suspended from the quay by 1-in. diameter short link chains passing through the tube. Washer plates slotted for the links at the top and bottom of the tube secure the whole in position. An extension of the chain at the bottom end carries a heavy weight to ensure that the fender retains the vertical position against the buoyancy of the water. If necessary on piled jetties (or cylinders), side stops are fitted to limit the lateral travel. This type of cushioning has proved effective not only in preventing damage to vessels but in considerably reducing the maximum force of the berthing blow.

* "Dock and Harbour Authority," October, 1943.

Fenders and Dolphins—continued

Floating Fender

Another simple, but ingeniously designed method in use on a solid quay, in a tidal river, is that of the floating fender in fig. 5. Mr. R. F. Hindmarsh, Chief Engineer of Tyne Improvement Commission, informs me they have given satisfaction and no trouble over 10 years in use. The Bergenske Shipping Company ordered these to prevent the paintwork of their ships coming into

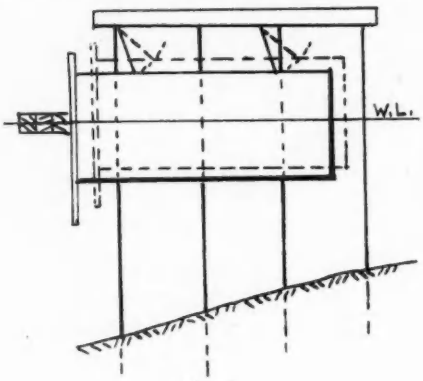


Fig. 7.

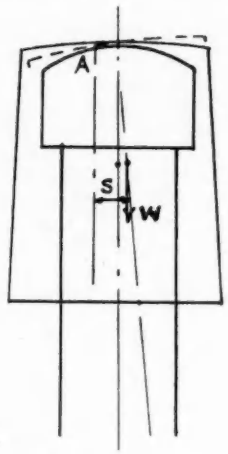


Fig. 8.

contact with the fixed fendering of the quay. The overall length of each fender is 42-ft. They are spaced with a 20-ft. gap between each fender. They are built up of pitch pine baulks 12-in. to 13-in. square, the outer baulk carrying an additional thickness of close grained Oregon pine 6-in. by 12-in. or 13-in. This is attached to the larger baulk by 3 No $1\frac{1}{2}$-in. diam. bolts E and 2 No $\frac{1}{2}$-in. coach screws D. The inside baulk is separated from the outer member by 3 No. $1\frac{1}{2}$-in. rubber washers 4-in. diam., sandwiching $\frac{3}{8}$-in. thick steel washers, also 4-in. diam. G. The connection between the outer and inner members is made with 6 No. $1\frac{1}{8}$-in. diam flat headed bolts B sunk 1-in. from surface of timber. Near the ends the bolts are twinned, and the intermediate bolts equally spaced. About 4-ft. from the ends $3\frac{1}{2}$-in. diam. holes C are pierced through the back baulk and C.I. thimbles are fitted top and bottom. The mooring guide chain which passes through these holes is $\frac{5}{8}$-in. or $\frac{3}{4}$-in. diam. short link secured by shackle to eye bolt at the top. The bottom end of chain is weighted with 1 cwt. weighted tube to prevent floating out from quay wall. At the ends of the baulks a $\frac{1}{2}$-in. thick specially made steel plate A is connected by 3 coach screws to outer timber. This plate forms a stopper guide. The outer end of plate is bent down to overlap the inner timber.

Various shock absorbing mechanical devices have been tried at the heads of timber piles which have not proved successful. They lacked sturdiness and simplicity and required more attention than is usually accorded to such equipment.

Suspended Fenders

Of late years there have appeared forms of suspended fenders, making use of gravitational forces to resist the impact blow. One particular type is shewn in fig. 6. A heavy weight in the form of a steel tube loaded with concrete blocks is suspended by links at the top and bottom. The pressure arising from the contact of a berthing vessel causes the weight to move inwards, as shewn by the dotted lines. Thus the kinetic energy of the moving vessel is absorbed in the work done in raising the centre of gravity of the weight through some vertical height. This is achieved by restraining the movement of the vertical weight by the links, so that horizontal movement is accompanied by vertical movement. The maximum height to which the tube is allowed to rise is when the links are about 70° from the vertical.

For example, if a suspended fender of 20 tons weight is collided with by a vessel, and the equivalent horizontal force of the blow is 20 tons, then for 13-in. rise of the C. of G. of the fender the energy absorption value is 13 x 20 = 260 inch tons, similarly if the horizontal force is 30 tons causing 20-in. rise of C of G. absorption value is 400-in. tons. The horizontal movements of fender for these values are 32-in. and 38-in. respectively. Such figures show the great cushioning effect of this device. Fenders of this type have been in use on an exposed jetty berthing vessels of 12,000 tons and have given great satisfaction for some years.

The points worthy of note are: the great distance through which the horizontal colliding force acts, and consequently, the low value of this force relative to the high absorption value of the fender. Thus a jetty provided with these fenders will not be subjected to as great a horizontal force as with the ordinary fender piles. On the other hand the latter do transmit an appreciable amount of shock into the ground, but the total deflection is considerably less than for suspended fenders. Whilst the added weight of the suspended fenders on the berthing side of the jetty may require a closer spacing of the main structural piles, it is claimed that the advantage of extra weight on the tension side of the structure is balanced by lighter requirements of raking piles.

The later designs of the suspended fender shew the supporting piles, to which the links are attached, at greater distance apart than the original. Combined with this, swivel couplings and flexible suspension wires allow of some lateral movement, to function efficiently under a glancing blow.

Another design of suspended fender operating on the gravitational principle is shewn in fig. 7. A large block of concrete is suspended horizontally by two sets of raked links from the jetty deck. The front end is faced with a timber baulk. The links are flexible steel wires raked transversely and longitudinally. For

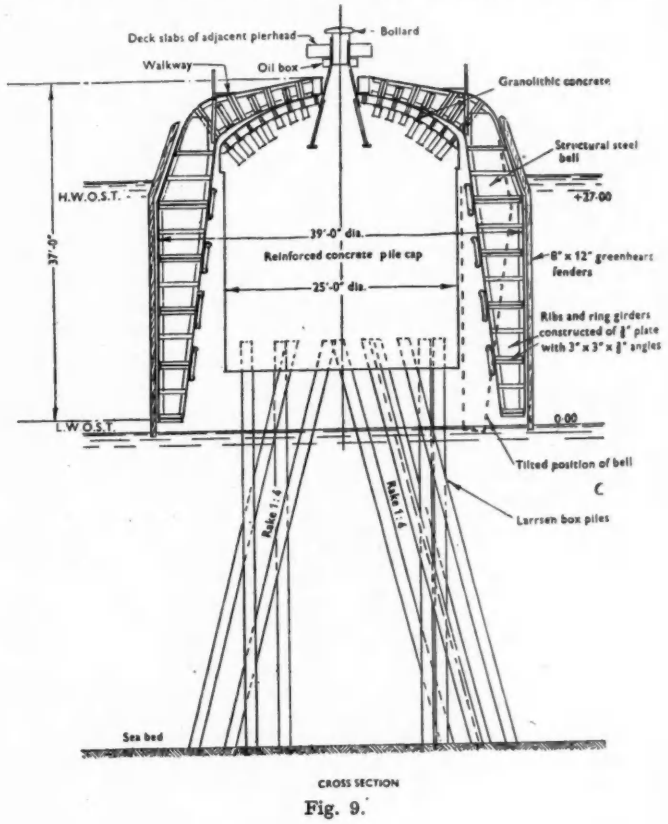


Fig. 9.

vessels of 20,000 tons or more a floating fender distributes the blow over several of these suspended blocks. In the normal position a stopper holds the links raked back so that the work done diagram of a blow instead of commencing at zero—has some initial pressure of low amount. The longitudinal V suspension of wires prevents swinging and the floating fender minimises the effect of a glancing blow.

Fenders and Dolphins—continued

Baker Bell Dolphin

Parallel with the subject of suspended fenders there is the Baker Bell Dolphin, a most ingenious device taking advantage of the oldest known mechanical principle: the lever. As the name implies the working element is shaped like a bell supported on a piled structure having a spherical or domed top. The inner face of the bell at the top forms a portion of a sphere (or ellipsoid) of greater radius than that of the support dome. There is therefore a spherical wedge shaped space, in cross section, fig. 8, between the bell and the support. Horizontal pressure applied to any point on the side of the bell will cause it to tilt about the vertical axis. The surface of contact will therefore move from the apex of the dome to some point A towards the side where pressure is applied. Consequently the centre of gravity of the bell is lifted in thus pivoting about A which is removed from the central position. Therefore a considerable couple (W x S) comes into being, the further the point A is from the centre line. A bell weighing 200 tons can absorb 3,600-in. tons of Kinetic energy, which is an extremely high amount.

Such Bell Dolphins have been used on an exposed jetty at Heysham for a number of years and have proved beneficial not only in preventing damage to the jetty, but to vessels themselves. The large virtual deflection of the bell under a blow relieves the supports of the high horizontal forces customary in the more rigid types. There is a further point of advantage. When the bell is struck a severe glancing blow it is free to rotate about its centre, and at the same time provide lateral resistance to the vessel's movement. Professor Baker, the inventor, tells me that one of the dolphins at Heysham was struck stern first by a vessel of 15,000 tons, pushing the bell over to its extreme position. The vessel at the time was moving well above the normal berthing speed—had the dolphin been rigid, it would have been carried away and the ship would have been damaged also.

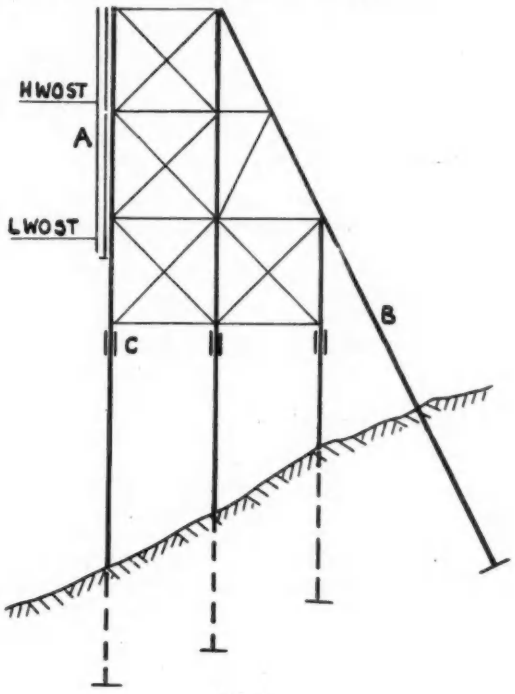


Fig. 10.

The bell or outer cage is constructed in steel and concrete loaded; or entirely in reinforced concrete. The outer surface is protected with vertical timber fendering spaced equally around the circumference, fig. 9.

Many dolphins are constructed of concentrated groups of vertical and raking reinforced concrete piles, those for the larger vessels being heavily loaded with thick concrete slabs. Such structures are of considerable rigidity and were it not for the elasticity of the ground many ships would suffer serious damage on impact. To avoid serious consequences several of our foremost harbour authorities favour the use of dolphins constructed entirely of timber for positions where there is the greater liklihood of mishaps, as for instance, at dock entrances, and jetty heads projecting into busy waterways, etc. Any damage suffered by these is comparatively easily repaired.

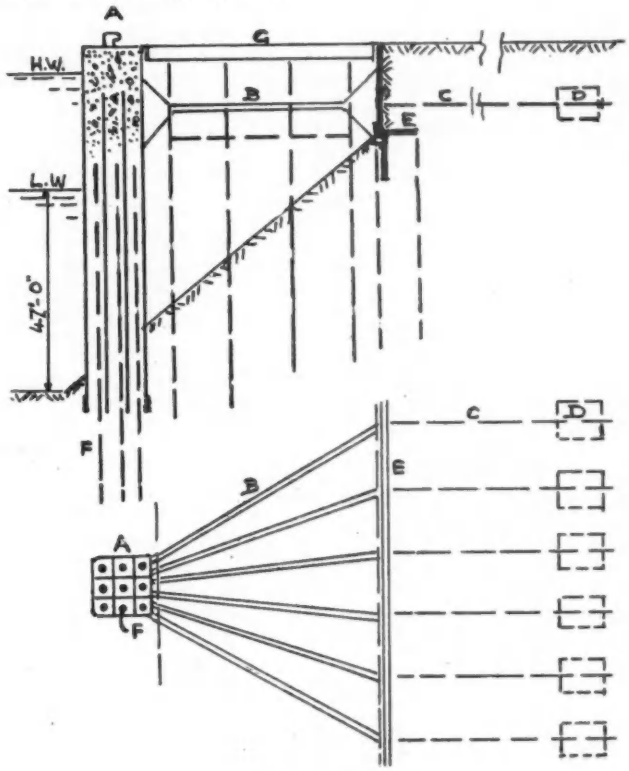


Fig. 11.

Screw Pile Dolphin

The construction of dolphins in estuaries where there is a deep layer of soft mud or silt is usually a difficult problem. Messrs. Braithwaite, who are experts in the construction of such structures on poor foundations, have shewn that a comparatively light construction will give effective service for a considerable period without mishap, even when sited in a strong tideway. There are several such dolphins in the Thames Estuary constructed to deal with vessels of 12,000 to 15,000 tons: fig. 10 shews the typical form of their construction. There are 9 vertical steel piles, 3 per bent, of 6-in. diameter, spaced at 10-ft. centres both ways. They are screw piles fitted with 4-ft. diam. C.I. screws at the toe and screwed to a depth of about 20-ft. below river bed. The two front piles of each bent are carried to the full height of the deck, but the backmost pile finishes just below the intersection with the raking pile at each bent. The deck height is about 50-ft. above river bed and 6-ft. above H.W.O.S.T. There is about 35-ft. of water at L.W.O.S.T Thus the front verticals are about 75-ft. overall. They are in two lengths: the screw portion being about 45-ft. long Coupling is shewn at C.

The raking piles B are of similar scantling to the verticals and the angle of slope is about 30° to the vertical. The strut bracings are double 6 x 3 x 14.5 lbs. channels, back to back, with tie bars $1\frac{3}{4}$-in. diam. jumped to $2\frac{1}{8}$-in. diam. at the turnbuckles: the cross bracings are single 3-in. x 3-in. x $\frac{1}{2}$-in. angles. For isolated dolphins side raking piles are fitted to the outer back verticals. The front of the structure is protected by 12-in. x 12-in. timber fenders and walings A. In spite of the lightness of construction these dolphins give efficient service and are speedily erected.

Fenders and Dolphins—continued

Strutted Dolphin

The French engineers at le Havre are responsible for an unusual design of dolphin protection to a deep water jetty for the accommodation of the "Normandie" and similar vessels. As shown in Fig. 11, the dolphin is placed on the outside of a piled jetty and is not connected to it in any way. A reinforced concrete open bottom cellular chamber A, about 15-ft. square divided into 9 compartments is sunk into the bed to about 4-ft. below dredged level. Reinforced concrete piles F are then driven through the centre of each cell into the ground for about 20-ft. The cells are then filled with concrete and a mass concrete cap brought up to deck level. This dolphin is connected to shore with struts B, which are independent of the jetty G. Where these struts meet the wall E tie bars C connect the system to the anchor blocks D. The retaining wall E is carried on piles and is also independent of the jetty G. The front face of dolphins are timbered. They are spaced at 140-ft. centres. Anchor blocks are at about 15-ft. centres.

Owing to the intervention of the war, since this work was completed, it is too early to say how effectively this construction meets the needs of the large liners for which it was designed. However, it is a bold departure from customary practice and its future functioning will be watched with interest.

Port Transport Industry

Excerpts from Report on Decasualisation of Labour

The Report of the enquiry authorised by the Minister of Labour under the powers conferred on him by the Dock Workers (Regulation of Employment) Act, 1946, was published early last month (H.M. Stationery Office, price 3d.).

The object of the enquiry, which was conducted by Sir John Forster, K.C., was to ascertain the views of both sides of the port transport industry in connection with the preparation of a permanent scheme for the decasualisation of dock labour, which will replace the present war-time schemes and must be put into operation by not later than 1st July next.

In his Report, Sir John Forster says that both sides of the National Joint Council for the Port Transport Industry are agreed upon the necessity for decasualisation and joint discussions have proceeded over a long period in an attempt to arrive at some mutually satisfactory plan to attain this end. A final effort to reach agreement was made as recently as 24th July, 1946, when the National Joint Council had under consideration a comprehensive decasualisation scheme presented by the Employers' Side. The scheme did not, however, commend itself to the Workpeople's Side of the Joint Council, for the proposals which it contained relating to management, and to the conditions which should attach to the guarantee to registered dock workers in the industry, raised issues upon which the parties are fundamentally opposed, and the Workpeoples' Side took the view that, unless and until these fundamental issues were disposed of, no useful purpose would be served by discussion of the other details of the scheme.

Employers' Proposals

The Employers' scheme envisages almost complete local automony for each of the ports to which the scheme might be applied. By a levy on wages, or partly by levy and partly by the imposition of a tonnage charge upon goods passing through the ports to which the scheme was applied, the Port Authorities would create a fund from which would be met the administrative cost of the scheme and sums payable to dock workers under the proposed guarantee. Dock workers, when not actually working for a Port Transport employer (described in the scheme as the "operational" employer) would be deemed to be in the employ of the Port Authority (the "legal" employer). The Authority would from time to time determine the number of men to whom the guaranteed wage could be paid and such determination would govern the size of the register. It is contemplated that circumstances might develop in any port covered by the scheme which would render it impossible to defray the cost of the scheme out of funds raised by the local Port Authority. To meet this position the scheme proposes the formation of a central body, to be known as the Dock Decasualisation Finance Corporation. To this body the Port Authorities for ports to which the scheme applied would make a contribution from monies levied or charged by them and, from the central fund so established, the Finance Corporation would assist necessitous Authorities who from time to time might be unable to meet their commitments under the scheme.

In the proposals put forward, the control of the register would be vested solely in the Port Authority and the dock workers would have no voice in the matter, though it should be stated that the scheme proposed envisages a joint committee to act in a purely advisory capacity. While, therefore, the Employers are prepared for joint consultation with the Workpeople's representatives, they are unwilling to accept any scheme for joint management upon the ground that such joint administration has in practice broken down. In support of this view they point to the fact that, while the National Joint Board of the Dock Labour Corporation was agreed that a reduction in the number of registered dockers was necessary, reduction to the level required had not been found practicable in face of the opposition from the Workpeople's Side to the removal of the names of any dock workers who were on the register before September, 1939, and it was in these circumstances that the Board of the National Dock Labour Corporation recently intimated that, owing to the divergent and irreconcilable views of its members upon this issue, it was unable to fulfil its major responsibility of maintaining a labour force sufficient, but no more than sufficient, to meet the needs of the industry.

As to the nature of the guarantee and the conditions which should attach to its receipt, the Employers originally proposed that they should guarantee to each registered worker who proved availability for work a sum of £16 per month, against which should be set the worker's total earnings during the like period. Subsequently, however, the Employer's representatives intimated that, upon further consideration, they were prepared to reduce from one month to one week the period to which the guarantee should be related, and they would regard the guarantee as a minimum fall back rate against which would be set all wages earned either during normal working hours or during week-end working or overtime hours. Work performed by dock workers is not, it is contended, overtime as that term is generally understood in industry, since the dock worker seldom works for more than the normal aggregate of 44 hours a week but is merely required by the nature of his employment occasionally to perform his work outside the normal hours, and on such occasions he is suitably remunerated at special rates.

Workpeople's Contentions

The Workpeople's Side of the National Joint Council are fundamentally opposed to any decasualisation scheme for the administration of which the Port Authorities are to be solely responsible. Based largely on the historical background of joint control in the Industry, the Workpeople's Side assert that only under joint control can schemes be effectively operated and that unless given an equal share with the Employers in administration they would feel compelled to disassociate themselves entirely from the future operation of schemes set up under the Act. They have pointed out that reductions in the register can never in the nature of things be popularly regarded by the rank and file dock worker and they have drawn attention to the impossible position in which the Union Officials would find themselves if they sought to secure, as they would be expected to do, an implementation of a decision to reduce the numbers on the register to which decision neither they nor their union had been parties. Joint control could never be effective, they state, if administration is to be by Port Authorities as proposed by the Employers, for on such Authorities the Workpeople's Side as such have no direct or indirect representation. They claim, therefore, that control of any schemes should be vested in a national joint body on which employers and dock workers should be represented and that such body should be charged with the duty of determining, from time to time, on a National basis, the size of the dock labour force, and entrusted

Port Transport Industry—continued

with power similar to that of the National Dock Labour Corporation to levy on wages to meet decasualisation costs.

With regard to the guarantee, the Workpeople's Side are opposed to the Employers' Side's suggestions and propose in substitution therefor:

(a) The payment of attendance money in respect of each normal " turn " when work is not available.
(b) An over-riding weekly guaranteed wage which, while in amount rather less than the equivalent of eleven turns at the ordinary time rate, would be considerably in excess of the equivalent of eleven turns of attendance money at the rate at present being paid.
(c) Only attendance money and wages paid in respect of work performed during the eleven normal turns to count against the weekly guarantee.

The claim put forward by the Workpeople's Side bears some similarity to the practice which has prevailed during the war and which is at present continuing. It is objected to by the Employers upon the grounds that war-time schemes are not suitable for application in any permanent peace-time arrangement, as they do not relate the guarantee to the amount of the worker's total earnings and permit of the receipt of attendance money over periods for which the worker could receive high earnings. Attendance at normal calls, the Employers feel, is reasonable quid pro quo for the guarantee of a regular weekly wage, while a payment specifically related to a period of unemployment is not appropriate to a scheme of decasualisation.

As the submissions and contentions of the two sides of the Industry centre largely upon the existing system of joint control operated by the National Dock Labour Corporation, it is necessary to examine in closer detail the conditions, objects and working of that body together with any other bodies which are within its control, or assist it in connection with the dock labour schemes for which it is responsible. The Coroporation was brought into existence in 1941 as a war-time expedient to administer schemes of decasualisation set up under the Essential Work (Dock Labour) Order, 1941 It is controlled by a National Joint Board consisting of representatives of Employers and Workpeople in the Industry in equal numbers, with a Chairman, Vice-Chairman and Financial Director appointed by the Minister of Labour and National Service.

In the ports in which it is responsible for the labour administration it operates through a Labour Manager, a servant of, and appointed by the National Board, and Local or Area Boards. The members of such Local or Area Boards are nominated by the Employers' and Workpeople's Sides of the Industry in the ports or areas for which they have been set up.

The functions of the Local or Area Boards are strictly controlled by the National Board so far as they relate to finance, but in no other direction. In relation to the number of workers upon the register in their ports or areas the Local or Area Boards are consulted by the National Board, but it is their duty to give effect to decisions taken by the National Board when that body determines upon an increase or reduction in the register and to put into practice such other directions as the National Board may properly give. The Local or Area Boards have themselves no power, however, to effect actual alterations of the register: they must pass any direction of the National Board to the appropriate Port Registration Committee. These latter bodies exercise the functions of

(1) defining in their areas—subject to the approval of the Minister of Labour and National Service—what is Port Transport Work,
(2) placing men upon the register when the register requires expansion,
(3) taking them off the register when it requires to be reduced, and
(4) classifying dock workers on the register within certain specified categories.

The Port Registration Committees are not even within the nominal control of the National Dock Labour Corporation or of its Local or Area Boards. It follows, therefore, that if Port Registration Committees choose to be intransigent, they can render completely ineffective decisions unanimously taken by the National Board and subscribed to by the Local or Area Board.

The National Board suffers from two disabilities therefore. It cannot in practice make effective a decision as to an increase or reduction in the register which is not acceptable to the Local or Area Board, for in such case the Local or Area Board may refuse to pass the necessary instruction to the Port Registration Committee. Nor can it make effective such a decision even where the Local Board is in agreement with the National Board, if the Port Registration Committee over whom the National Board has no control refuses, as in fact it sometimes does refuse, to act upon it.

Conclusions

In his conclusions, Sir John Forster points out that the need for the rapid handling of goods and turn-round of ships in United Kingdom ports and for establishing, promoting and assisting the establishment at such ports of an adequate, regular and mobile labour force for undertakings engaged in operations connected with the handling of goods or the turn-round of ships is, in the present labour shortage, no less urgent now than it was when the National Dock Labour Corporation came into existence, and one of the primary objects of any authority which is to administer a scheme for decasualisation must still be to ensure that there are upon the port registers sufficient, and no more than sufficient, dock workers to deal efficiently with the trade of the ports. Failure to attain this object will inevitably result in a very heavy charge upon any guarantee fund established, which must be followed by a rise in prices for almost every commodity which the public requires.

In his view, the primary object stated above can best be effected if decasualisation schemes are administered by some national joint body working as has the National Dock Labour Corporation through Local or Area Boards. In arriving at this conclusion he is not unmindful of the difficulties which the National Dock Labour Corporation has experienced in the discharge of its functions in relation to the reduction of the dock registers and he has given much thought to the proposals made by the employers that control of any decasualisation scheme should be placed in the hands of the existing Port Authorities. He was, however, impressed by the following factors:—

(1) The measure of joint control to which in the past the Port Transport Industry has been subject.
(2) The inadvisability of abandoning such measure of joint control as the Port Transport Industry already enjoys, at a time when the need for closer co-operation of employers and workpeople in industry in general is much in the public mind.
(3) The admission of the Employers' Side of the National Joint Council that, without the co-operation of the Workpeople's organisations, the scheme which the Employers propose would be administratively impracticable.
(4) The disinclination, quite clearly expressed by the Workpeople's Side, to give any active support to any scheme for decasualisation to be made under the Act which is not to be administered jointly by the two sides of the Industry.

In so far as the National Dock Labour Corporation can be said to have failed effectively to control the port registers, its failure appears to be due not to any lack of authority to take decisions but an inability to ensure the proper application and observance of decisions when taken.

" I have expressed above my views upon joint responsibility and the obligations which the acceptance of joint responsibility must entail. These views have received general acceptance in the course of my Inquiry and the Workpeople's representatives did not dissent from the unequivocal statement of one of their number that, were a system of joint control to be adopted in connection with a permanent scheme for decasualisation, it would be the duty of the Workpeople's organisations to see that the decisions and policy of any joint body were given effect to. I see good reason, therefore, to hope that the difficulty which has beset the National Dock Labour Corporation in relation to the control

Port Transport Industry—continued

of the register would not arise in connection with permanent full-time schemes for decasualisation. In my view, the decasualisation scheme most likely to prove successful would be one administered by a central body of the character of the present National Dock Labour Corporation, whose Central Board should be drawn in equal numbers from the two sides of the Port Transport Industry, and to which should be added an independent element consisting of a Chairman and two Members appointed by the Minister of Labour and National Service. In a Board so constituted, finality of decision should always be possible of attainment."

The powers of the Central Board, he suggests, should be no less wide than those at present vested in the National Dock Labour Corporation and in certain directions the Central Board's powers should be strengthened. It is of the essence of any such scheme that general control should rest with the Central body for were it to lie elsewhere, as for example with bodies in the localities, it would be impossible for the Central Authority who would be neither aware of nor able to control the actions of such local bodies, to formulate any central policy. To assist in the discharge of its functions in connection with decasualisation the Central Authority should, however, set up Local or, where administratively convenient, Area Boards to cover respectively individual ports or groups of ports. Such Local or Area Boards, like the Central Board, should be jointly constituted from the two sides of the Industry in the ports or areas and should have added an independent element consisting of a Chairman and, if possible, two Members. Subject to an obligation to observe directions received from the Central Board, Local or Area Boards should be given as wide a measure of autonomy as is possible in connection with the carrying out of the day-to-day work in their ports or areas.

Duties of Area Boards

The Local or Area Boards should undertake the discharge of all those duties in relation to the control of port registers, the classification of workers appearing thereon, and the definition of port transport work at present undertaken by Port Registration Committees which, while empowered to discharge important functions in relation to existing dock labour schemes, owe no allegiance to the Central, Local or Area Boards responsible for administration. Whilst responsibility for decisions to increase or reduce the number on the registers must remain with the Central body, that body should take Local or Area Boards into consultation before decisions are arrived at and it should be open to any Local or Area Board which feels that the particular needs of its port or area require an increase or reduction in the register to make application to the Central Board for permission to open or reduce its register. The rapid reduction of the register, following a decision of the Central Authority that reduction is necessary, is imperative. "To retain on the register dock workers who are surplus to normal requirements, for any longer period than administrative necessity demands must inevitably result in a serious and unwarranted financial burden and one which, if allowed to continue, might reduce any decasualisation scheme to a state of insolvency."

As regards mobility of labour, inter port transfers between ports within daily travelling distance have, it would appear, proved successful but transfers between distant ports are claimed by the Employers to have given rise to an unsatisfactory state of affairs. Men so transferred, it is stated, frequently arrived with a sense of grievance and did not work to capacity, and, their presence was apt to create friction with the dock workers of the ports to which they had been directed.

To Sir John it seems to be most undesirable even if it were found practicable for Port Authorities to undertake the increase or reduction of their registers upon a day to day or other short interval basis. If men temporarily recruited are to be discharged immediately the need for their services is past, this would amount to the re-introduction of a casual element into the Industry, and on the other hand, if, whilst there is a surplus of registered labour unemployed and drawing upon the guarantee fund at one port, men are to be recruited locally at some other port to meet a temporary local need, and are to be retained after the need is past until such time as a general revision of the register might normally be expected to take place, then the decasualisation scheme will be subjected to a dual charge and one which might have been avoided if the temporary shortage of labour at the one port had been met by the utilisation of labour temporarily surplus at the other. As part of the price of a permanent decasualisation scheme jointly administered by some central body, the Workpeople's Side should be prepared to accept a provision for the direction of labour to distant ports subject to some form of protection to meet hard cases.

Ports to be Covered by the Scheme

Sir John accepts as sound the Employer's contention that decasualisation schemes should be applied only to ports where there is a considerable volume of overseas and coasting trade, and where there is a substantial number of workers who look to the Port Transport Industry to provide their major means of livelihood. To apply any scheme to ports where these conditions do not exist would, he thinks, be to put upon the decasualisation scheme a burden which it might well prove unable to bear.

The Guarantee

A guarantee under a decasualisation scheme should not be regarded as a substitute for a pension scheme for registered dock workers, and when they reach the age at which they must normally expect to give place to younger and more virile men, they must not look for continued support towards a guarantee financed by the employers in the Industry but, like workers in other industries who reach a pensionable age, must look for a pension to any national scheme provided out of national funds. For those to whom it attaches, the guarantee should, in Sir John's view, take the form of a weekly fall-back sum which should be sufficient to meet a worker's minimum needs, while at the same time not being so high as to constitute a temptation to him to rely upon the guarantee rather than upon actual employment.

To qualify for receipt of the guaranteed payment the worker should be required to prove availability by attendance at normal calls and, if he fails without just cause to make such attendances, the guarantee should be regarded as broken.

He cannot accept the view of the Workpeople's Side that the only sums to be set against the guarantee should be those earned by a registered dock worker within normal working hours, and he sees no reason why there should not be set against the employer's obligation to guarantee a minimum fall-back payment all sums earned by the registered dock worker in the Port Transport Industry during the guarantee period, whether such sums are derived from work within the normal hours or result from overtime or week-end working. If total earnings are not to be set against the weekly fall-back sum to which a dock worker proving availability is to be entitled, then it is inappropriate to refer to such a sum as a guarantee. It should more properly be described as an addition to wages.

With regard to discipline, it should be within the power of the local manager of any scheme to suspend a registered dock worker for misconduct and/or to report him to the Local or Area Joint Board for removal from the register of dock workers. In cases of suspension, the worker if aggrieved should be permitted to appeal to the Local or Area Joint Board. The consequence to the registered dock worker of removal from the register, involving as it would expulsion from the Industry, are so serious that a worker aggrieved by the decision of the Local or Area Joint Board to remove his name should be given the right to appeal to an entirely independent tribunal. Such a tribunal should be composed of one or more persons entirely independent of the Industry, and the decision of the tribunal should be final.

No right of appeal should be given to any dock worker against the removal of his name from the register by the Local or Area Board where such removal is pursuant to a direction to reduce the register. The right of appeal should, however, attach in cases where a Local or Area Board when periodically reviewing the register are of opinion that a worker's record is not such as to justify the application of the guarantee in his case.

Recent Protection Works carried out on the Sea Wall, Bray, Co. Wicklow.

By H. A. DELAP, B.A., B.A.I., Assoc.M.Inst.C.E.

Introduction

The works described in this Paper cannot be considered large-scale engineering, either in extent, complexity or cost. It is hoped however that they may be of some interest, first as a record of a piece of repair work, designed and carried out under abnormal conditions—the "emergency" years 1941-1944—each step being planned in the light of the materials, plant and facilities available at a particular moment; factors which had sometimes completely altered when the time came to put the works in hand. Secondly, as an account of a 60-year-old engineering work, carefully designed by a competent engineer (familiar with local conditions, unhampered by lack of money and assisted by the best contemporary advice), and substantially built by an experienced contractor—which 60 years later was in such serious danger as to call for expenditure equal to its original cost to prevent the complete failure of about one-third of the whole.

While the interest to practical engineers of some at least of the works described must be mainly academic—since it is to be hoped that such emergency conditions will never recur—the somewhat unorthodox methods called for may perhaps suggest other applications or other new ways of handling familiar materials, which may find a use even when normal times return.

(1)—Background to the Works Described

Geographical Note.—North of Bray Head, which projects half-a-mile from the generally smooth outline of North Wicklow, the coast line runs North-North-West almost straight for about a mile to Bray Harbour and the Dargle River, then inclines a few degrees northward for a further two miles before beginning to curve round Killiney Hill. The half-mile of coast immediately South of Bray Harbour is protected by Bray Sea Wall. (Fig. 1).

Except at Bray Head itself this three miles of coast consists of boulder clay, overlaid by a sand and shingle beach. North of Bray Harbour the clay is exposed above high water mark in vertical cliffs, but between the harbour and Bray Head, in front of the town, the shore up to the time when the sea wall was built seems to have been bounded by low sand dunes, perhaps partly formed into artificial banks, covered by bent.

Construction of the Sea Wall.—The Sea Wall, 3,129-ft. in length (Fig. 1), was built by a well-known Glasgow contractor in the years 1884-1886 at a cost of approximately £20,000—an average cost of £6 8s. per lineal foot. The following quotations from a report prepared by the Town Commissioners' Engineer are noteworthy, in view of later developments:—

"The line for the proposed sea well . . . . is, as nearly as possible, the high water line of spring tides."

"The beach . . . consists of shifting shingle and sand, so that the stability and permanency of the proposed wall will be governed by the depth to which it may be taken. Indeed, it will be essential for its permanency that the foundation be deep, for the history of the coast line here is that year after year . . . . the sea is encroaching on the land."

"The foundation of the proposed sea wall will in some places rest upon the clay formation, and the land drainage is provided for by a 9-in. hole through each of the lower blocks."

(It was originally proposed to build the wall on 30-ton concrete blocks, lowered into the foundation trench. Cast-*in-situ* concrete was, however, substituted).

A cross-section accompanying a Paper[1] by the Town Commissioners' Engineer shows the wall backed by shingle and sand filling, with earth above the original esplanade level, surfaced by a 9-in. concrete slab and a ¾-in. coat of asphalt. The 9-in. drain holes mentioned in the Report are also shown emerging 8-ft. below beach level, which meets the face of the wall at high water Springs.

Two years after its completion (according to a later report by the engineer) a heavy south-easterly gale caused some damage to the promenade immediately behind the sea wall. Settlement of the back-fill caused longitudinal cracking of the deck slab, in general a continuous crack at mid-span, the deck settling from 1-in. to 5-in. at the centre. The asphalt surfacing was torn up in places—probably as a result of the settlement of the slab—and was subsequently dispensed with altogether. The sea wall itself was stated to have suffered no damage.

In the following years 1890-95, Bray Harbour was built (Fig. 1)—at a cost of about £46,000. From that time the beach changed in a remarkable manner. Prior to the building of the sea wall erosion seems to have occurred at various points along the beach, evidence having been given before the Coast Erosion Commission,[2] for example, of damage at the extreme southern end of the beach. By 1941 beach level against the face of the wall—which had been approximately + 15.0 O.D.[3] in 1886—was down to + 6.0 O.D. at the northern end, while the southern end topped the wall—(+ 22.0 O.D.).[4]

*Paper (slightly abridged) discussed at a recent Meeting of the Institution of Civil Engineers of Ireland, and reproduced by permission.

1. Trans., Inst. C.E.I. Vol. XIX. 1st Feb., 1888. P. F. Comber, Member: "Bray Sea Wall and Promenade."
2. Report of the Royal Commission on Coast Erosion and Afforestation, Vol. III., Part II.; published by H.M. Stationery Office, 1911.
3. Irish Ordnance Datum is at approximately Low Water of Equinoctial Spring Tides.
4. Temporary reversals of this tilt have occurred—e.g., prolonged S.E. gales in 1930 lowered the Southern part of the beach by as much as five feet, with a corresponding rise further North—but the general tendency has been as described above.

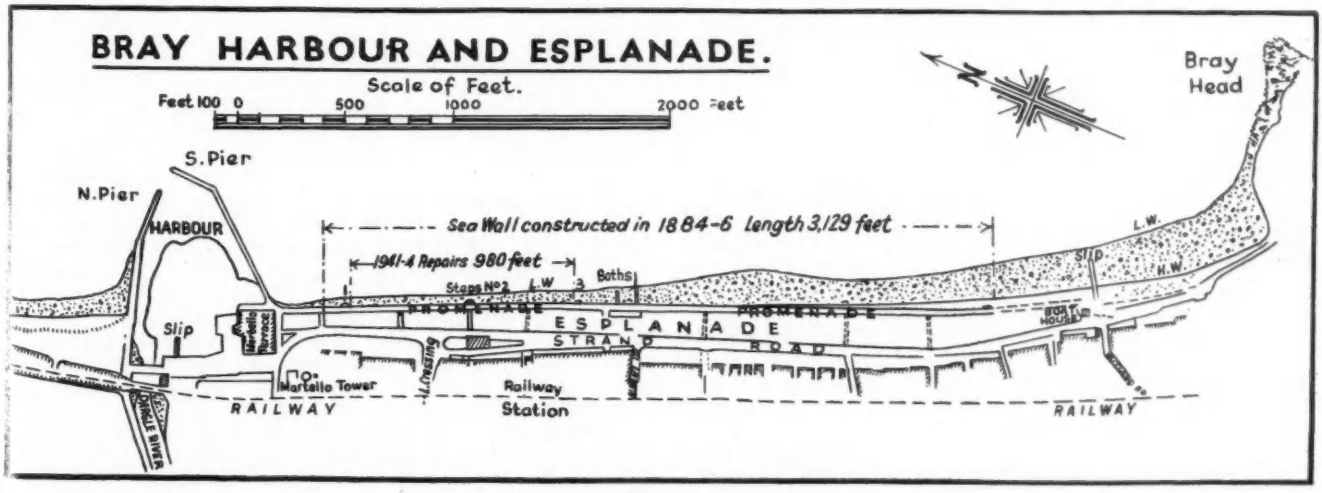


Fig. 1.

Recent Protection Works carried out on the Sea Wall, Bray—continued

The beach has, in fact, behaved like a see-saw, parallel to the sea wall and some 5,000-ft. long, pivoting at a point between 1,500-ft. and 2,000-ft. from the northern end, its northern tip slowly falling approximately 9-ft. and consequently leaving between 500 and 1,000 at that end of the sea wall seriously exposed.

Probable Causes of the changed conditions.—It seems probable that two factors produced this result; the building of Bray Harbour and the building of the sea wall itself. These combined to cut off this mile of beach from the greater part of its supply of gravel, which must come either from further along the coast or be produced by erosion of the local beach itself. The sea wall cut off the latter supply, while littoral travel was blocked by the harbour piers—projecting some 600-ft. from original high water mark.

Elsewhere on the southern part of the East Coast littoral drift appears to be normally from south to north, erosion occurring north of projections and accretion south of them. The piers at Courtown, Arklow, Wicklow and Greystones exhibit one or both these tendencies. At Bray however the accumulation of material just north of the harbour, and to a much greater extent north of Bray Head—together with similar small accumulations against minor projections along the beach—indicate that here the drift is from north to south.

By interrupting this drift the harbour and Head act as super-groynes, producing the familiar accretion on one side and scour on the other.

Added to this steady travel of irreplaceable material towards Bray Head has been the fact that, as the northern part of the sea wall became more exposed, scour set up by waves striking its relatively vertical face (which had been designed to stand above high water) naturally tended to increase.

The sea wall shows evidence of a succession of attempts to protect it from this denudation. About twenty-five years ago a continuous masonry buttress, or apron, 6-ft. square, was constructed along a considerable part of the toe of the wall (Fig. 2). At the same time, or somewhat later, timber piles with

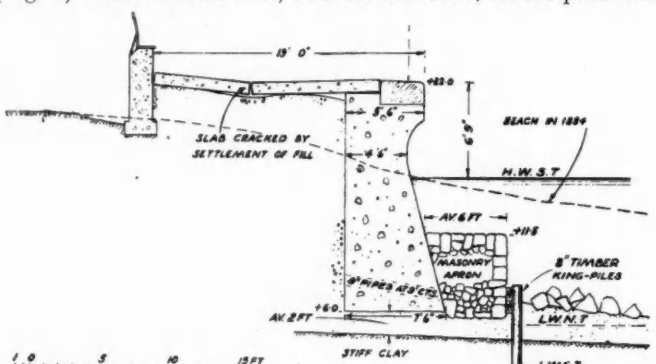


Fig. 2.

longitudinal walings were driven in front of this apron. Large quantities of heavy rubble were also dumped on the lowest parts of the beach, no doubt delaying erosion considerably. By 1941, however, the position had become serious. The wall was exposed to its foundation for about 500-ft. and for a further 500-ft. was covered from 1 to 2-ft.

The lowered beach had naturally uncovered the mouths of the 9-in. drain holes. These had been plugged when the masonry apron was added, but probably not before some of the gravel filling had escaped through them. Early in 1941 heavy seas breaking over the wall caused further settlement of the deck slab. Soon several small breaches appeared near the base of the wall—apparently local points of weakness in the concrete—and large quantities of filling were washed out, leaving several " craters " immediately behind the wall into which the deck slab collapsed.

At the same time the more exposed portions of the apron in front of the wall were shaken severely, becoming detached from the wall face and broken up, several sections either distintegrating completely or rolling forward on the beach.

This was the position when, at the request of the Department of Local Government, a survey was undertaken by the Office of Public Works.

Scour Behind Sea Wall.

(2).—Solutions Considered

There appeared to be two ways by which the length of sea wall in danger would have to be saved from final collapse. Either the progressive lowering of the beach must be stopped—or rather reversed, since much of the wall footing was already exposed—or the wall must be made as far as possible independent of beach conditions.

The first method was obviously attractive and the possibility of building up the beach by groyning was, therefore, examined. At first sight the tendency already noted for beach material to collect against the north side of minor projections, such as access steps between promenade and beach, seemed to favour the success of groynes. Two factors had, however, to be considered. There was first the *general* tendency of the beach to fall at the north end and rise at the south due to the super-groynes—harbour and Head. Although there was a level difference across every minor projection the average beach level at any given obstacle became successively higher to the south. Any new minor projection, such as a groyne would therefore have to act as it were in the shadow of the super-groynes, and it did not seem likely that they could overcome the general tendency exerted by these, even if placed so close together as to be extremely expensive.

A second factor which seemed unfavourable to groynes was the marked effect upon beach level produced by changes of wind. The general long-term north to south drift described above is probably mainly a tidal one. Superimposed on this steady variation however are more violent temporary oscillations, north, north-east and easterly (onshore) winds accentuating the long-term tilt of the see-saw; south-east and south winds causing a marked reversal of the general drift. Off-shore winds have relatively little effect. These rapid changes—as much as 8-ft. vertically in two tides—were hardly affected by the minor projections referred to, average beach level against such projections oscillating almost as much as elsewhere, and it seemed probable that even full-length groynes spaced reasonably close together would be unable to do more than retard the heavy scour caused by prolonged north-east winds.

It is generally agreed that groynes should be low and as far as possible adjustable to changes in beach level. The familiar Case groyne is designed to project very little above beach level and to be raised progressively as beach material builds up. If groynes are allowed to stand appreciably above beach level their beneficial

Recent Protection Works carried out on the Sea Wall, Bray—continued

effect is often more than balanced by the danger of scour on the lee side.

When therefore a beach is subject to sudden changes in level heavy maintenance charges must be faced if groynes are to be effective, while the groynes must be substantial and closely spaced. Moreover, unless they could be relied upon to maintain *at all times* a certain minimum depth of beach material over foundation level of the sea wall, groynes at Bray could not be considered a solution to the problem of making that wall safe. The experience of the Town Commissioners with groynes seems to have been unhappy, but since no details of design were available this fact was not of much help. The Dublin and South Eastern Railway Company, however, in their evidence to the Coast Erosion Commission disclosed that after considerable experience of their operation both north of the harbour and along the coast between Greystones and Wicklow, groynes had been abandoned in favour of direct protection by rubble or concrete blocks. Case groynes 250-ft. long and 150-ft. apart north of the harbour had been found to collect little material, mainly large shingle and small boulders close to a sea wall which, in spite of such protection, had been seriously undermined.

The success of groynes appeared therefore so problematical, and the need for action so urgent, that it was reluctantly decided to leave the beach to itself and to give the wall some more positive protection, designed to be as far as possible independent of beach conditions.

Trial pits sunk in front of the wall where damage had been most serious showed hard clay underlying sand, gravel and boulders, at about + 4.0 above Ordnance Datum. The base of the sea wall, which could be directly observed for a considerable distance, was at or near + 6.0 O.D.—the masonry protective buttress or apron against its face being carried about 6-in. lower (Fig. 2).

At first sight the failure of the builders of the wall to carry it down to the hard stratum is difficult to understand. Conditions in 1884 must however be remembered. Beach level along the wall face was then about + 15.0 O.D. and with a wall buried for 7-ft. in gravel and protected by a natural spending beach most engineers would have felt satisfied. The effect of building the harbour could hardly have been foreseen. In fact, the designer states in the Paper referred to that, except in places, the wall was carried 1-ft. into the marl. It was an unhappy coincidence that some of these places should have occurred where the beach was later to be so eroded as to leave the wall exposed for its full height.

Short of taking down the wall completely and rebuilding it on a satisfactory foundation two alternative methods of making it independent of beach conditions were open; either to underpin the wall directly or to leave it standing on its existing gravel bed and build a continuous screen or wall immediately in front and parallel to it, to prevent any further disturbance of the material on which it stood.

Examination showed that the wall generally was still remarkably sound and plumb. Only where the loose back-filling had been completely washed out, leaving the wall standing without back support to steady it against wave blows did open construction joints show signs of internal weakness. Its 7-ft. 6-in. base must therefore be still adequately supported for the greater part of its width, and it seemed logical to leave the existing supporting material as far as possible undisturbed and to concentrate upon ensuring that nothing else could disturb it.

A strong argument in favour of this course was the copious stream of water which flowed out at low tide through the porous material upon which the wall stood, from back-filling saturated by salt water at high tide and no doubt also by some fresh water from inland. Experimental attempts to remove material from directly under the front of the wall produced an immediate and progressive landslide of similar material from further in. Apart from the obvious direct danger to the wall it would clearly be difficult to place satisfactory concrete underpinning in such conditions without coffer-damming, both behind and in front of the wall. A cofferdam behind the sea wall would have entailed the removal of the gravel back-fill, leaving the wall highly vulnerable to wave action, since steel sheet-piling which would have made possible the driving of a water-tight cofferdam down through the back-fill, was not obtainable in sufficient quantities.

It was accordingly decided to confine direct under-pinning to the short sections of the wall where the back-fill was already gone, and to provide a continuous protective screen in front of the wall face, taken deep enough to deal with any further foreseeable lowering of the beach.

It ought perhaps to be emphasised that coast protection works carried out with reasonable regard for economy can seldom be considered a final cure. In Bray any further erosion will ultimately reach the hard clay. The rate of denudation should then be very much slower; equilibrium might in fact be reached. It would, however, have been economically unsound, in the designers' opinion, to carry the protective screen so deep as to provide an absolute guarantee against the need for any future works. Their aim has been a design suited to the abnormal conditions under which the works had to be carried out, adequate as far as could be foreseen for many years and capable of extension if conditions should ever require it.

The sea wall in general was, as stated above, remarkably sound. It was, however, exposed for a much greater height than its designers had contemplated and its back-fill had been disturbed. Some positive buttressing was desirable, and the protective screen should therefore not only prevent undermining but also give some lateral support to the base of the wall. This could be achieved by filling the space between the screen and the face of the wall—or the apron where this was still sound enough to be left undisturbed—with concrete or masonry.

The old masonry apron had disappeared for about 200-ft., and it was first thought that the whole of the remainder would have to be removed. Much of it was found to be still adhering firmly to the face of the wall and it seemed logical to treat it as part of the wall base, leaving the material on which it stood undisturbed for the reasons already stated. It would then continue to form a positive buttress once the danger of undermining had been removed.

The flow of water from under the wall and its tendency to wash out material disturbed in any way limited the possible methods of constructing the screen. Any open excavation close to the wall would clearly be dangerous and since it was thought necessary to carry the screen down to at least 5-ft. below the wall base—that is to + 1.0 O.D., 3-ft. into the clay—cast-*in-situ* concrete or bag-work was ruled out.

The materials for sheet-piling, the solution that would normally suggest itself, being unobtainable pre-cast unreinforced concrete caissons, sunk in a continuous line in front of the sea wall, were next considered.

This method had several points to recommend it:—

(a) It would avoid disturbance of the material carrying the wall, which was a constant anxiety—(even the driving of sheet piles might have been dangerous).

(b) It would avoid unnecessary movement of beach material—particularly of clay—in front of the wall, since a caisson would sink piston-fashion.

(c) Concrete forming the exposed face of the new work would be cast " in the dry," while the concrete filling of the caisson could be placed in the efficient cofferdam formed by the caisson itself.

Reinforcement to provide against all the possible stresses set up when sinking through boulder clay on an exposed beach was unobtainable. It was therefore proposed to omit all steel.

(3).—Experimental Work—Season 1941-42

Two questions had clearly to be answered before this scheme could be adopted:—

(1) Could any form of open caisson be sunk through this beach in a reasonable time?

(2) Could such unreinforced caissons be handled without injury?

A sum of £500 having been allocated for the dual purpose of answering these questions and carrying out the necessary

Recent Protection Works carried out on the Sea Wall, Bray—continued

"first-aid" repairs to prevent existing damage spreading, work was begun late in 1941 by the Office of Public Works, continuing until the following Spring.

This work need not be described in detail. It became in the main a race between first-aid measures and accelerating deterioration of the sea wall, with interludes for experiment. Breaches were plugged, weak patches grouted, unsupported sections of the wall were under-pinned from the rear and protected at the toe by a temporary cast-*in-situ* concrete screen in front, carried down to the clay (Fig. 3). Badly damaged areas of deck

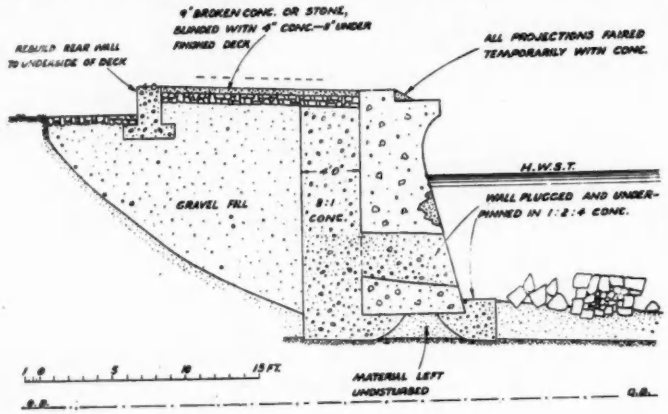
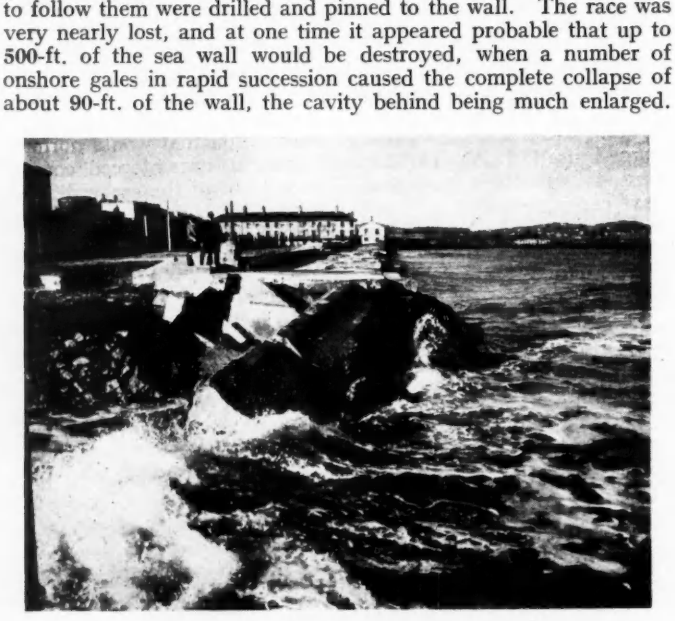

9" BROKEN CONC. OR STONE, BLINDED WITH 4" CONC.—9" UNDER FINISHED DECK
REBUILD REAR WALL TO UNDERSIDE OF DECK
ALL PROJECTIONS FAIRED TEMPORARILY WITH CONC.
H.W.S.T.
GRAVEL FILL
WALL PLUGGED AND UNDER-PINNED IN 1:2:4 CONC.
MATERIAL LEFT UNDISTURBED
15 FT.

Fig. 3.

slab were broken up, the fragments being used to fill the cavities which had formed between the slab and the filling, the whole being then blinded with gravel and topped with 4-in. of concrete, on which the new deck was later to be laid. Projecting edges of slabs and any other points where seas might obtain a grip were faired-off or otherwise sealed. A considerable number of heavy granite copings had been washed on to the beach and those liable to follow them were drilled and pinned to the wall. The race was very nearly lost, and at one time it appeared probable that up to 500-ft. of the sea wall would be destroyed, when a number of onshore gales in rapid succession caused the complete collapse of about 90-ft. of the wall, the cavity behind being much enlarged.



Breach in Sea Wall—November, 1941.

For about twelve hours it seemed likely that the cavity would spread inland to the road, if not to the houses beyond, while the unsupported ends of the sea wall, left "in the air" showed a tendency to peel off indefinitely. Fortunately, the weather moderated. Rubble dumped over the rim of the cavity and built into very rough pitching temporarily stopped its spread, while heavy mass-concrete bulkhead walls were built at right angles to the sea wall close to its unsupported ends, anchored to it by steel ties and carried back into undisturbed ground. These bulkheads prevented the lateral spread of the cavity and steadied the ends of the sea wall long enough for the missing section to be rebuilt. This new section, like all the first-aid work, was carried down only as far as the clay, 2-ft. under beach level and the base of the wall—that is to about + 4.0 O.D. This was considered safe until the deeper permanent screen could be constructed outside.

Long periods of overtime work by artificial light at mid-winter were necessary before the situation was fully under control. By the end of December, 1941, however the position was easier, and by March, 1942, the whole of the exposed 1,000-ft. was reasonably, if temporarily, secure.

The rapid deterioration and collapse described had necessitated a reconsideration of both the cost of the preliminary work and of the total length of wall requiring permanent protection. The first season's work ultimately cost about £3,500.

During this somewhat exciting winter a good deal had been learnt. It had been established that open unreinforced caissons could be safely handled and sunk to a satisfactory depth into the clay by manual excavation—though the first attempt was painfully slow.

The first caisson sunk was an oblong box, 4-ft. by 9½-ft. inside and 5-ft. deep, with sides tapering from 15-in. at the bottom to 9-in. at the top and ends a uniform 15-in., the base being formed as a cutting edge all round. The total volume of concrete was about 6 cub. yds., the mix was 1:1½:3 and the weight 10 tons. The inside dimensions were selected to give just sufficient room for two men to use pick and shovel safely, and provided adequate clearance for the operation of a small grab, the general aim being a small and manageable unit. Guesswork determined the thickness of the walls.

This caisson was cast on the beach, 8-ft. clear of the sea wall, on a patch cleared as far as possible of obstructions, the formwork being set up and filled between tides.

(To be continued)

Clyde Lighthouses Trust

The Annual General Meeting of the Clyde Lighthouses Trust was held on 4th December last with Mr. George A. Workman in the chair. Submitting the annual accounts, the chairman said that the revenue for the year was £13,309, a decrease on that of the previous year of £14,850. Expenditure charged to revenue was £20,503, a decrease of £9,399. The revenue fell short of expenditure by £7,194, and that sum had been met out of general reserve. The gross tonnage of shipping on which dues were paid for the past year was 6,479,584, a decrease of 10,934,183 tons.

The total decrease in revenue from rates on shipping was £15,217. On the expenditure side, dredging costs for maintenance amounted to £7,555, and that sum had been transferred to the debit of the reserve amount which now stood at £11,180. The total of the special reserve accounts was £55,297, a reduction of £11,613.

During the year a system of wireless telephony was installed between the *Torch* and the works at Port Glasgow, and it had been found of great benefit in cases of emergency. All the lights within the jurisdiction of the Trust had been restored to their pre-war positions and brilliancy. They had decided to electrify the Centocke Beacon, and it was hoped that the work would be put in hand next spring and the new light would be in operation before next winter.

Maintenance dredging, which usually was necessary every four of five years, was undertaken during the past year and the channel was reported to be at its full statutory depth. Owing to additional costs and the reduction in the number of vessels using the river and estuary, the trustees were compelled to withdraw the discount on rates charged as from August 21st last.

The accounts were unanimously approved, and Mr. Workman and Lieut.-Colonel Campbell were re-elected chairman and deputy-chairman respectively.

The Port of Liverpool

Chairman's Annual Report

At a meeting of the Mersey Docks and Harbour Board, held on the 12th December last, Sir Thomas A. L. Brocklebank, Bart., Chairman, in his annual statement, made the following remarks:—

The Accounts for the twelve months ended July 1st last, showing a deficit on Revenue Account of £774,211, clearly require explanation.

The Finance Committee of the Board gave very careful consideration to the method of handling this deficit for balance sheet purposes and decided to show it in full. We might have asked permission to suspend the annual contribution to the Sinking Fund; we could have decided not to allow the customary interest on our Reserve Funds; and have withdrawn such sums from those funds as to wipe out the debit balance altogether. We felt, however, that the reasons for the deficit being incurred were quite abnormal and unlikely to recur and that it was better to show it in full in the confident belief that it can be gradually eliminated as conditions of trade settle down more nearly to normal.

You will remember that during the years 1943-4-5 our revenue was running at a high level due to the large imports of food and war material on account of the British and United States Governments. During this period the Board were involved in heavy liabilities for income tax and might even have become liable for excess profits tax if we had not voluntary reduced the surcharge on our rates and dues from 60% to 25% as from April 2nd, 1944.

The end of the war in Europe saw the beginning of the reduction in the number of ships and the amount of cargo passing through the port; the conclusion of hostilities with Japan, followed as it was by the abrupt termination of lend-lease, accelerated the process. Then came the dock strike in October, which reduced our revenue for that month by about £150,000. Meanwhile, a large number of important passenger ships which had been regular visitors to Liverpool were now able to return to their customary bases of London and Southampton, while the Ministry of Food diverted large quantities of foodstuffs, particularly refrigerated cargo, to South Coast ports.

As a result of all this, it became clear to us that we should have to raise our rates and dues substantially. Some little time elapsed before actually applying for an increase to the Ministry of Transport, as it was obviously necessary to produce the facts and figures to support the application. However, these were approved by the Board on December 5th, 1945, and the application sent to the Ministry on December 6th. This was eventually approved by them to take effect as from March 1st, 1946, and we increased our loss by a further £250,000 in the meantime. Since March 1st, our revenue has equalled or exceeded our expenditure, despite steadily rising costs of operation, and as trading conditions settle down and Liner services are gradually restored to normal, we can see signs of general improvement. It must, however, be borne in mind that if the balance of our trade is swung towards export rather than import this will affect our revenue, as outward dues are only about half the inward dues on any particular commodity. Furthermore, a loading ship occupies a berth for a longer time than a discharging ship.

The port is busy—on days recently we have had as many as 65 to 70 deep sea ships working—not far short of our war-time peak. The success of the Dominion Wool Sale held here recently for the first time since 1924 was an encouraging sign, while we have a number of enquiries for the establishment of new, or the expansion of existing, trades on or near the Dock Estate.

We are going ahead as fast as we can with repairs to war damaged property and the reconstruction and modernisation of the port. Amongst the more urgent repair jobs now in hand are the Gladstone—Hornby Lock, the rebuilding of sheds in the Gladstone, Alexandra, Canada and Huskisson Systems, the replacement of hundreds of damaged shed doors all over the Dock Estate, and the reconstruction of the Riverside Station. Work on all these important jobs is proceeding slowly, far more slowly than we could wish, but unfortunately the shortage of labour and materials to which I referred last year, persists; in fact, I think it would be fair to say that we are having even more difficulty in obtaining material than we were twelve months ago, and I am sorry to say that there are no signs of improvement up to now.

With regard to new works, we are hoping to complete the New Waterloo Entrance within the next 12 months and we are providing new storage accommodation for the timber trade at the north end of the estate on the west side of Crosby Road South, which we believe will be of considerable value to the trades concerned.

In all our plans for the future, we are consulting and being advised by the users of the port as to what they really need, and we are grateful to them for their co-operation and assistance towards a solution of our joint problems.

The financial position as regards war damage remains obscure, but negotiations are proceeding through the medium of the Dock & Harbour Authorities' Association and some progress towards a settlement appears to have been made.

We have resumed work on the Training Banks in the Channel and increased the amount of dredging and, on the whole, I think we can say that the entrances to the port are in good condition. Orders have been placed for the building of three grab dredgers, one bucket dredger and a salvage and conservancy vessel, whilst we have bought a Hopper barge, a tug and two floating cranes. We believe that there are great possibilities in the use of radar by port authorities, and, after most careful investigation, we are hoping to be able to place a contract for the installation of the type considered best suited to our needs before the end of this year.

To sum up, the past year has been one of difficulty, but also of some achievement. As I said last year, in these rapidly changing times what the future may have in store is anyone's guess, but whatever it may be, we shall do our best—so long as we are allowed—to face it in a spirit of keenness and optimism, determined to overcome the many problems as they arise.

In conclusion, I should like to say a word about the staff. The majority of those who have been on service with H.M. Forces have now returned and we are glad to welcome them back. The whole of our staff, both office and outside, have worked throughout the year with keenness and enthusiasm and such success as we may have achieved is in a large measure due to them, and I should like to take this opportunity of extending to them our thanks and congratulations on what has been accomplished despite the many difficulties and uncertainties of the transition from war to peace-time conditions.

Trade at the Port of Hongkong.

According to a report in the "Far Eastern Economic Review," the Port of Hongkong is now handling about 75 per cent. more shipping than Shanghai, and 10 per cent. more than the whole of China. During October, shipping which entered and cleared Hongkong totalled more than 1,100,000 tons, making a total of 7,048,000 tons for the first 10 months of this year.

Errata.—With regard to the notice describing the projected extensions at the Port of Sunderland which appeared on page 192 of the issue for December last, we regret that a misprint showed the estimated cost of the proposed scheme as £35,480: whereas the figure should in fact read £355,480.

GOVERNMENT OF NORTHERN IRELAND.

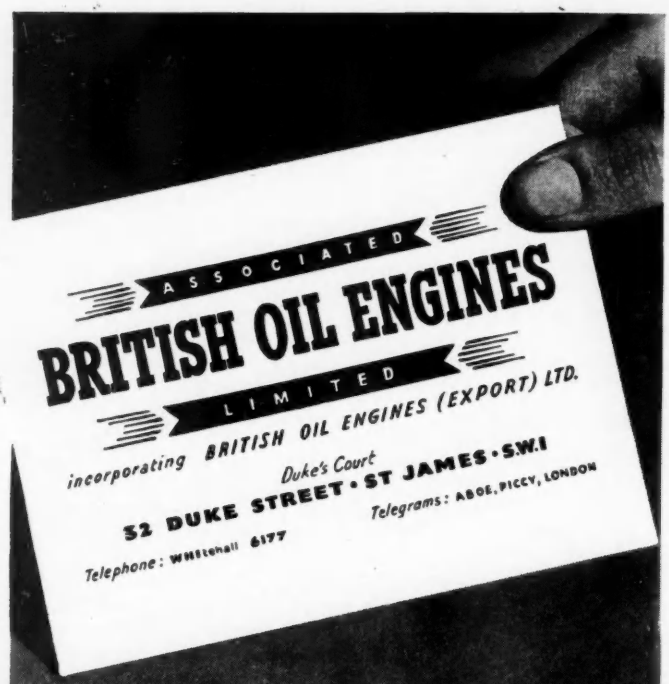
DISPOSAL OF SURPLUS PLANT.

The Ministry of Finance offers for sale the dipper dredger, "Leprechaun," which was engaged until recently on dredging works on Lough Neagh and the Lower Bann River.

The following is a brief description of the "Leprechaun":—

Built in 1938 by Messrs. Fleming & Ferguson, of Paisley.
Hull consisting of three pontoons with two forward and one stern spud. Bucket capacity 2 cubic yds.
Steam operated machinery with oil fired boiler.
Maximum dredging depth 19-ft., dumping reach 72-ft., and height 23-ft. above water line.
Spare bucket, spud feet, bank spuds and miscellaneous spares.

Full detailed information may be obtained from The Director of Works, Ministry of Finance, May Street, Belfast, and the vessel, which is laid up near Lough Neagh, may be inspected by interested parties by arrangement.



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